Weill Graduate School of Medical Sciences of

CORNELL UNIVERSITY

2002-2003

445East 69th Street
New York, NY 10021 U.S.A.
Web Site: http://www.med.cornell.edu/gradschool
e-mail: gsms@med.cornell.edu

Academic Calendars

2001

Orientation for new students ..... Monday, August 20 - Friday, August 24
Registration for **Quarter I** and **Fall Semester (On-Line Registration)** ..... Monday, August 20- Friday, August 24
Opening Exercises ..... Tuesday, August 21
Quarter I and **Fall Semester** begin ..... Monday, August 27
Labor Day Holiday observed ..... Monday, September 3
Final date to drop a course for **Quarter I** ..... Monday, September 10
Quarter I ends ..... Friday, October 19
Examinations for **Quarter I** ..... Friday, October 19 - Friday, October 26
Registration for **Quarter II (On-Line Registration)** ..... Friday, October 26 and Friday, November 2
Quarter II begins ..... Monday, November 5
Final date to drop a course for **Quarter II** ..... Monday, November 19
Thanksgiving recess ..... Thursday and Friday, November 22 and 23
Winter recess: Instruction suspended 5:00 p.m. ..... Saturday, December 15 - Tuesday, January 1

2002

Winter recess ends: Instruction resumed 9:00 a.m. ..... Wednesday, January 2
Quarter II and **Fall Semester** end ..... Friday, January 4
Examinations for **Quarter II** ..... Friday, January 4 - Friday, January 11
Last day of completing requirements for January degrees ..... Friday, January 11
Martin Luther King, Jr.'s Birthday observed ..... Monday, January 21
Conferral of January degrees ..... Wednesday, January 16
Registration for **Quarter III** and **Spring Semester (On-Line Registration)** ..... Tuesday, January 15 and Friday, January 18
Quarter III and **Spring Semester** begin ..... Monday, January 21
Final date to drop a course for **Quarter III** ..... Monday, February 4
Presidents' Day Holiday observed ..... Monday, February 18
Quarter III ends ..... Friday, March 8
Examinations for **Quarter III** ..... Monday, March 11 - Friday, March 15
Registration for **Quarter IV (On-Line Registration)** ..... Monday, March 11 - Friday, March 15
Spring recess: no classes ..... Monday, March 18 - Friday, March 22
Quarter IV begins ..... Monday, March 25
Final date to drop a course for **Quarter IV** ..... Monday, April 8
Last day to register for participation in Commencement ..... Friday, April 19
Twenty-Second Annual Vincent du Vigneaud Memorial Research Symposium: no classes ..... Tuesday, May 7
Last day of completing requirements for May degrees ..... Monday, May 13
Quarter IV and **Spring semester** end ..... Friday, May 17
Examinations for **Quarter IV** ..... Monday, May 20 - Friday, May 24
Convocation Ceremony, 11:00 a.m., Weill Auditorium ..... Monday, May 20
Commencement Day, conferral of May degrees, 3:00 p.m., Avery Fisher Hall ..... Monday, May 20
Memorial Day Holiday ..... Monday, May 27

SUMMER TERM 2002

Registration **(On-Line Registration)** ..... Monday, June 17 - Tuesday, June 21
Summer research term begins ..... Monday, June 23
Independence Day Holiday observed ..... Thursday, July 4
Last day to complete requirements for August degrees ..... Friday, August 16
Conferral of August degrees ..... Friday, August 26
Summer research term ends ..... Monday, August 26

Note: Courses are taught on a quarterly basis, degrees are granted at the end of the Fall semester, Spring semester and Summer term. Calendar are subject to change at any time by official action of Cornell University.

The Well Graduate School of Medical Sciences of Cornell University has scheduled classes on religious holidays. Students missing classes due to the observance of religious holidays will be given ample opportunity to make up work.

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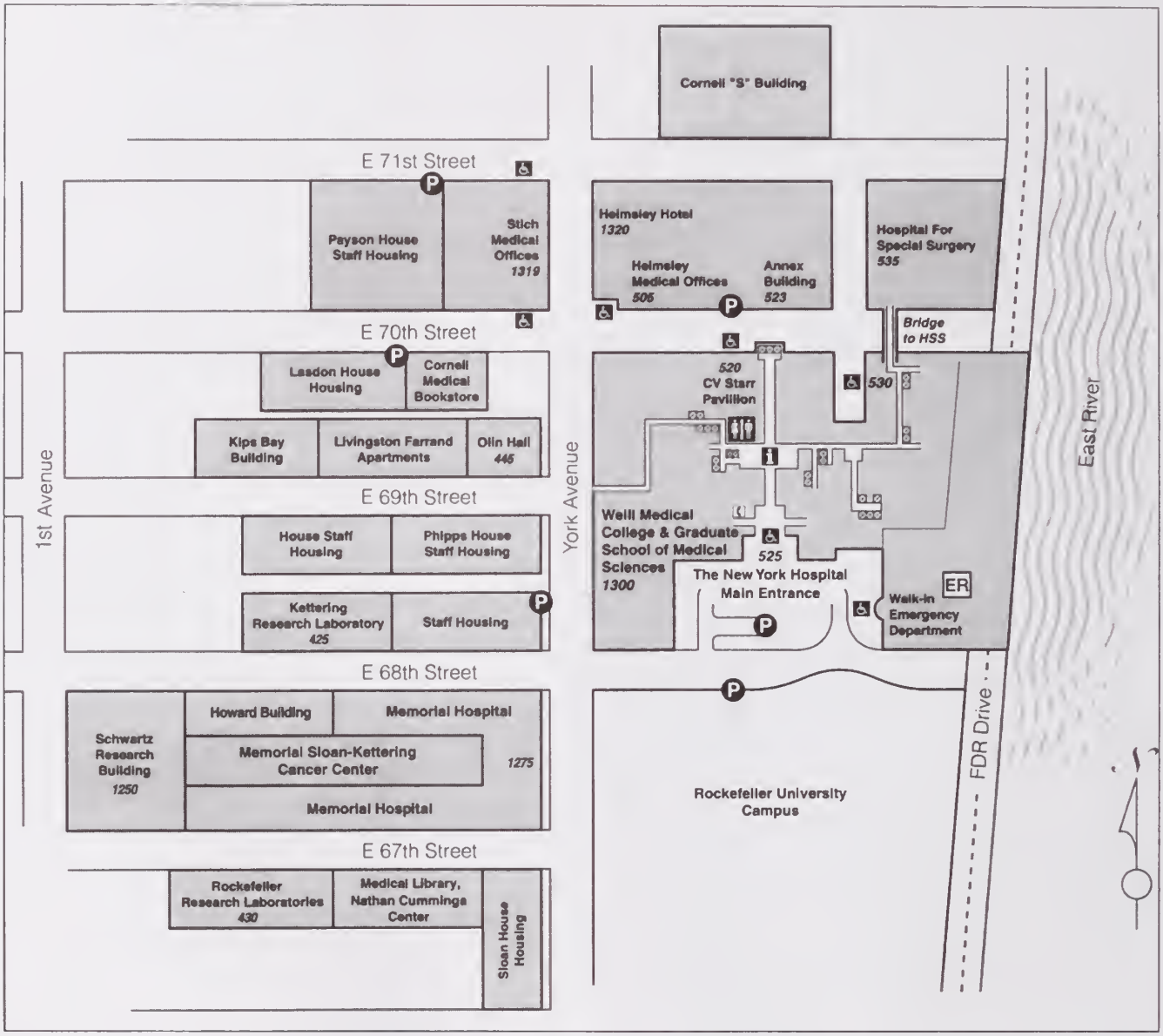
Campus Map


Cornell "S" Building
E 71st Street
Payson House Staff Housing
Stich Medical Offices 1319
Heimsley Hotel 1320
Heimsley Medical Offices 506
Annex Building 523
Hospital For Special Surgery 535
Bridge to HSS
E 70th Street
Lasdon House Housing
Cornell Medical Bookstore
520 CV Starr Pavilion
530
Kips Bay Building
Livingston Farrand Apartments
Olin Hall 445
1st Avenue
York Avenue
East River
E 69th Street
House Staff Housing
Phipps House Staff Housing
Weill Medical College & Graduate School of Medical Sciences 1300
525
The New York Hospital Main Entrance
ER
Walk-in Emergency Department
Kettering Research Laboratory 425
Staff Housing
E 68th Street
Schwartz Research Building 1250
Howard Building
Memorial Hospital
Memorial Sloan-Kettering Cancer Center
1275
Memorial Hospital
Rockefeller University Campus
FDR Drive
E 67th Street
Rockefeller Research Laboratories 430
Medical Library, Nathan Cummings Center
Sloan House Housing

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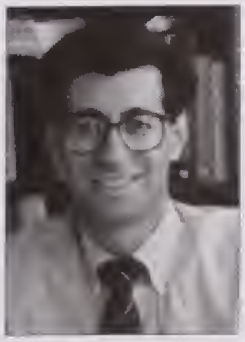
Weill Medical College and Graduate School of Medical Sciences of Cornell University

The Rockefeller Research Laboratories of the Sloan-Kettering Institute



Dear Prospective Student:

This catalog presents the faculty and programs of study of the Joan and Sanford I. Weill Graduate School of Medical Sciences of Cornell University. If we define biomedical science as the pursuit of knowledge in areas of fundamental biology relevant to human health and disease, then the unique resources of our school can indeed provide a superb training opportunity for those interested in the medical sciences. Medicine and biology are in the midst of an unprecedented revolution, which is unraveling the molecular mechanisms governing basic biological processes such as gene replication, intracellular signaling, trafficking of lipid and proteins, neuronal communication, host-defense mechanisms, protein folding, and embryonic development, to name a few. From these insights, new strategies and technologies for addressing the diagnosis and therapy of disease have evolved. Our seven graduate programs offer unique research and educational opportunities for you to master the scientific method of conducting investigate research. We believe that the training opportunities supported by NIH training and research grants will also open doors for rewarding careers in many fields of professional activity including academia, industry, government and health affairs.

The Weill Graduate School of Medical Sciences of Cornell University is located in New York City and is part of a complex of adjoining world-renowned institutions on Manhattan's East Side. It is dedicated to excellence in biomedical research. The school's location in New York City is an exciting and safe place to live, and our residential buildings are modern and inexpensive. Training toward the Ph.D., M.S. and combined M.D.-Ph.D. degrees is offered by members of the basic and clinical units of Cornell's Medical College and the Sloan-Kettering Institute. With a roster of 203 outstanding faculty members and 240 students, the school offers a faculty-to-student ratio that ensures a close and productive working relationship between each student and their faculty mentor.

We invite you to examine the programs defined in this catalog. We are happy to receive your application for admission should you decide that your own scientific interests and preparation match with the graduate training offered by our institution.

David P. Hajjar, Ph.D.
Vice Provost and Dean

Weill Graduate School of Medical Sciences of Cornell University

Organization

Members of the professional staffs of two major medical institutions, Joan and Sanford I. Weill Medical College of Cornell University (WMCCU) and the Sloan-Kettering Institute (SKI), form the core faculty of the Graduate School of Medical Sciences. This unique academic partnership was formalized in 1952 under the auspices of the Graduate School of Cornell University at Ithaca and has resulted in the creation of a faculty whose research interests span the full spectrum of biomedicine. This well-integrated faculty has had one unifying mission - to offer a carefully designed, research-oriented graduate program that adheres to the highest standards of graduate education.

The Weill Graduate School of Medical Sciences of Cornell University is part of a large biomedical center extending along York Avenue between 65th and 72nd Streets on Manhattan's upper East Side. The center's institutions, which are committed to research training and patient care, include the Weill Medical College of Cornell University, The New York Hospital, the Memorial Sloan-Kettering Cancer Center, the Hospital for Special Surgery, and The Rockefeller University. The great majority of the research laboratories of the faculty of the Graduate School of Medical Sciences and other academic core facilities are located within the Weill Medical College of Cornell University-New York Hospital complex and the research laboratory buildings of the Sloan-Kettering Institute.

Among the many information resources available to students on campus, the Samuel J. Wood Library and C.V Starr Biomedical Information Center are especially noteworthy. The modern library houses over 151,160 volumes and subscribes to 1,424 journals in an ambiance characterized by both beauty and comfort. The library is one of the country's first fully automated medical libraries featuring computer terminals that provide access to its collections from any of several hundred networked desktop computers and student workstations throughout the Medical Center. In addition, the Nathan Cummings Center at Memorial Sloan-Kettering Cancer Center has joined with the libraries of the Weill Medical College of Cornell University, The Hospital for Special Surgery and The Rockefeller University to share databases.

There are a wide variety of training opportunities in biomedical science available to graduate students at the Graduate School. Over 220 faculty members with common interests in graduate education and basic biological and biomedical scientific research become members of the graduate school faculty in a particular Program of Study headed by two Program Chairpersons and a Program Director. The Graduate School of Medical Sciences offers Ph.D. training in the following 7 Programs of Study.

- Biochemistry and Structural Biology
- Cell Biology and Genetics
- Immunology
- Molecular Biology
- Neuroscience
- Pharmacology
- Physiology, Biophysics and Molecular Medicine

In addition, the Graduate School of Medical Sciences also offers a Master of Science Degree program in Clinical Epidemiology & Health Services Research to qualified physicians and nurses with relevant experience.

Student Training

All students admitted to the Graduate School of Medical Sciences are provided a generous stipend of $24,273 per year for living expenses in addition to a full fellowship covering all tuition expenses. Students apply for admission to the Program of Study of their choice. Initial program selection is often guided by a student's prior research experiences. However, the initial designation of a program is far from rigid. For example, after becoming aware of the great variety of research projects available for thesis preparation, students may remain in their original program but may choose a faculty member affiliated with another program as thesis advisor, or may change programs altogether.

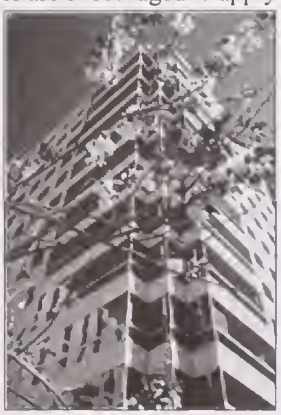
Entering students take a series of intensive courses required by the Program of Study which are intended to give a deep fundamental understanding of the discipline and provide an introduction to research at the frontiers of these research areas. First year students also perform 12 week rotations through laboratories of the faculty, allowing them to do research in a variety of disciplines that will aid them in the selection of a thesis project. These rotations make the student aware of the intellectual breadth and depth of research conducted by the faculty and how modern research is conducted using sophisticated state-of-the art methodologies.

In addition to conducting experimental laboratory research, students learn to communicate their work to other students and faculty by presentations at the Vincent du Vigneaud Memorial Research Symposium, organized by Graduate School students and held annually on campus. Students also present their research to other members of their programs and at national and international meetings. Students presenting their work at national meetings are guaranteed travel and accommodation funds for annual meetings during their graduate careers.

Selection of elective course work, as well as thesis research and preparation, are done by the student with the guidance of a Special Thesis Committee of three graduate school faculty members. One of the members of this committee is the student's major sponsor, an individual who serves as research mentor and collaborator for the Ph.D. thesis project.

By the end of the second year, when the student has completed course work and laboratory rotations, an examining committee of faculty administer the written and oral Admission to Doctoral Candidacy Examination (ACE). The aim of this examination is to allow the student to demonstrate his or her general knowledge in a chosen area of specialization, as well as demonstrate an ability to approach experimental design with creativity and technical insight. It is the responsibility of the Special Thesis Committee to recommend the award of the Ph.D. degree. This recommendation requires not only the fulfillment of certain formal academic requirements, but is also based on evidence of the development by the candidate of a critical and creative approach to science. The demonstration of this ability is embodied in the doctoral thesis which the candidate presents to the faculty as an original research contribution.

All students in the Graduate School are in training for the Ph.D. degree. A small number of college graduates are admitted each year to the Tri-Institutional MD-Ph.D. Program. The admissions process for the MD/Ph.D. Tri-Institutional Program is completely independent of applications to either the Weill Graduate School of Medical Sciences of Cornell University or the Weill Medical College of Cornell University. Those individuals contemplating a dual MD/Ph.D. career are encouraged to apply to the Tri-Institutional MD/Ph.D. office on campus. Please e-mail: mdphd@med.cornell.edu



Student Life

The Weill Graduate School of Medical Sciences of Cornell University offers apartment housing to all full-time students for the Ph.D. training period. Rents paid by students are subsidized and are considerably lower than those charged for comparable housing on Manhattan's upper East Side. Rents charged are very affordable in relation to stipend support awarded to each student, leaving a reasonable amount for comfortable living in Manhattan.

Students live within a few blocks of classrooms and laboratories on a self-contained campus that is part of a safe residential neighborhood on the prestigious upper East Side of Manhattan. Numerous shops and restaurants in the immediate vicinity lend this neighborhood an aura of a small, well-

defined community. Student life is dramatically augmented by being located within one of the world's great cities - a metropolis that Cornell students enjoy soon after their arrival on campus when they are taken on tour as part of their orientation program. New York City offers an unmatched range of cultural and recreational activities, many within walking distance of the campus and all readily accessible by public transport. Much of the world's best art, music, theater, ballet, cinema, and cuisine is concentrated on Manhattan island and therefore is practically at every student's doorstep. Our major museums are world-famous, ranging from the Museum of Modern Art on 53rd Street, and the Whitney Museum of American Art on nearby Madison Avenue, to the giants on Fifth avenue which include the Metropolitan Museum of Art and the Guggenheim Museum. West of this area, across Central Park, are the American Museum of Natural History (with its famous dinosaur exhibit) and the Lincoln Center for the Performing Arts, featuring the Metropolitan Opera and the New York Philharmonic. Farther downtown, Carnegie Hall, renowned for its offerings of both classical music and jazz, is located amidst New York's most fashionable shops. On summer evenings, free concerts and opera are performed on the lawns of Central Park. Tickets to cultural events, including Broadway plays, movies, operas and concerts, are provided to graduate students at affordable prices.

For sports enthusiasts, there is Madison Square Garden, home to the Knicks and Rangers. Magnificent Central Park, the East River Promenade near Cornell, and the Hudson River Promenade near the World Financial Center are nearby for strolling, biking, jogging and roller blading. Subsidized admissions to a complete workout gymnasium, including swimming pool are available through the Graduate School. During the warmer months, street fairs are held in various neighborhoods of the city.

Immediately surrounding the campus, students' non-academic needs are met in a variety of ways. Free noon-time music recitals, featuring fine soloists and groups, are held on Fridays on the adjacent Rockefeller University campus. Students also participate in jogging, aerobics, weightlifting, basketball, and squash. Numerous international restaurants and first-run cinemas provide nourishment and entertainment for every taste. For food shopping, there are several supermarkets, and a small grocery or take-out deli is on nearly every street corner.

Those inclined to roam a short distance beyond the New York City limits can participate in student-organized hiking or skiing trips to the Catskills and Green Mountains of Vermont. Also within easy reach, Long Island is surrounded by beautiful beaches facing the Atlantic Ocean.

New York City is an unparalleled place to learn and to do science. Excitement and enrichment are in store for the student who wishes to experience our great city.

Training Grant Support Available For Pre-Doctoral Students

In addition to the central fellowships that are available to support our pre-doctoral students, a number of graduate students are also supported by training grants from the National Institutes of Health (NIH) and the Cancer Research Institute.

Program Director	Title	Agency
Paolo Casali	Immunology Research Training Grant	National Institute of Health
Lorraine Gudas	Cancer Pharmacology	National Cancer Institute
David Hajjar	Vascular Biochemistry and Atherosclerosis	National Heart, Lung, and Blood Institute
Charles Inturrisi	Pharmacology and Neuroscience of Drug Abuse	National Institute on Drug Abuse
Enrique Rodriguez-Boulan	Tri-Institutional Training Program in Vision Research	National Eye Institute
Joan Massagué	Training Program in Molecular and Cellular Biology	National Institute of General Medical Sciences
John Wagner	Molecular Mechanisms of Neurological Disease	National Institute of Neurological Disorders and Stroke
Carl Nathan	Pre-Doctoral Fellowship Program in Tumor Immunology	Cancer Research Institute

Programs of Study

Biochemistry & Structural Biology

Cell Biology & Genetics

Immunology

Molecular Biology

Neuroscience

Pharmacology

Physiology, Biophysics & Molecular Medicine

Master of Science in Clinical Epidemiology & Health Services Research

Additional Areas of Concentration

Cancer Biology

See Programs:

Cell Biology & Genetics
Molecular Biology
Pharmacology

Chemical Biology

See General Information:

Training Program in Chemical Biology

Computational Biology

See Programs:

Biochemistry & Structural Biology
Physiology, Biophysics & Molecular Medicine

Developmental Biology

See Programs:

Cell Biology & Genetics
Immunology
Neuroscience
Pharmacology
Physiology, Biophysics & Molecular Medicine

Microbiology

See Programs:

Immunology
Molecular Biology

Biochemistry & Structural Biology

Faculty

Olaf S. Andersen
Francis Barany
Esther M. Breslow
David Eliezer
Jonathan Goldberg
Steven S. Gross
David P. Hajjar
Jerard Hurwitz
Scott Keeney
Richard N. Kolesnick
Christopher D. Lima
Min Lu
Kenneth J. Marians
Frederick R. Maxfield
Timothy E. McGraw
Diana Murray
Dimitar B. Nikolov
Dinshaw J. Patel
Nikola P. Pavletich
Marilyn D. Resh
Hugh D. Robertson
James E. Rothman
Benoît Roux
Timothy Ryan
Stewart Shuman
Suresh S. Tate
Paul Tempst
Hao Wu
J. Jillian Zhang

Graduate Program Chairpersons

Frederick R. Maxfield, Department of Biochemistry, Joan and Sanford I. Weill Medical College of Cornell University, Room E215, 1300 York Avenue, New York, NY 10021, (212) 746-6405

Dinshaw J. Patel, Cellular Biochemistry & Biophysics Program, Sloan-Kettering Institute, 1275 York Avenue, New York, NY 10021, (212) 639-7207

Graduate Program Directors

Christopher Lima, Department of Biochemistry, Joan and Sanford I. Weill Medical College of Cornell University, Whitney 304, 1300 York Avenue, New York, NY 10021, (212) 746-6449, E-mail: cdl2001@med.cornell.edu

David Eliezer, Department of Biochemistry, Joan and Sanford I. Weill Medical College of Cornell University, 1300 York Avenue, New York, NY 10021, (212) 746-6557, E-mail: dae2005@med.cornell.edu

Overview of Research Activities

The Program in Biochemistry & Structural Biology offers unique opportunities to develop comprehensive research training in areas of:

1. molecular structure determination,
2. molecular mechanism of membrane trafficking,
3. protein folding,
4. signal transduction mechanisms,
5. gene structure and nucleic acid chemistry.

Calmodulin-dependent Protein Kinase (Goldberg/Kuryian at Rockefeller University)

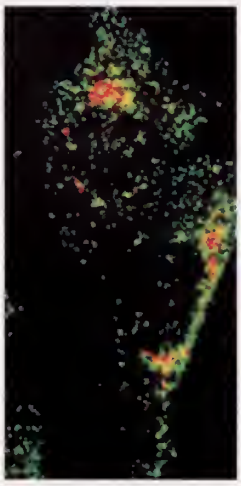
All research laboratories use biochemical or biophysical approaches to the study of biological systems.

Molecular structure determination is studied at different levels by investigators in the Program. Olaf Andersen uses molecular modeling systems coupled with single-channel experiments to define the structure of ion conducting channels. Jonathan Goldberg uses x-ray crystallography to study protein and lipid kinases involved in signal transduction. Christopher Lima studies molecular processes involved in protein sumoylation, lipids and mRNA maturation. Dimitar Nikolov also uses x-ray crystallography to study signal transduction elements of the nervous system, such as axon guidance molecules. The structures of oncogenes and tumor suppressors are analyzed via x-ray crystallography by Nikola Pavletich. NMR approaches and studies of molecular dynamics are used by Dinshaw Patel to determine solution structures of nucleic acids. Hao Wu is studying the structural mechanisms of receptor signal transduction for the TNF family receptors in cell survival and cell death using x-ray crystallography, David Eliezer studies the roles of non-native states of proteins in biology and disease.

The molecular mechanism of membrane trafficking are studied by several investigators. Frederick Maxfield's laboratory uses optical microscopy to observe and understand receptor trafficking and cell motility. Tim McGraw uses molecular cell biological methods to study general endocytic membrane recycling and insulin-regulated membrane trafficking. Tim Ryan uses quantitative optical methods to study synaptic vesicle recycling. James Rothman studies intracellular vesicle traffic and protein folding in an attempt to understand how cells distribute newly synthesized proteins.

Protein folding and translocation are studied by several investigators. Esther Breslow is currently studying how the structure of a pituitary protein, neurophysin, relates to oxytocin and vasopressin binding and function. Min Lu uses biophysical and molecular biological methods to study the structure and function of the HIV viral envelope glycoprotein. Suresh Tate investigates the molecular basis of mammalian amino acid transport.

Signal transduction processes are studied by several laboratories. Steven Gross is undertaking molecular studies to define nitric oxide biosynthesis and its physiological action. David Hajjar's laboratory is determining the structure-function relationship between lipoproteins and their receptors, and their impact on cholesterol trafficking. Jillian Zhang is studying the molecular mechanisms of cytokine-induced transcription activation in the JAK-STAT pathway. Richard Kolesnick examines how sphingomyelin and ceramide participates in signaling which can impact on apoptosis in the cell. Marilyn Resh's laboratory focuses on the role of fatty acid acylation processes in the determination of the structure and functioning of signal transducing proteins.



Different endocytic compartments in a cell. Two different endocytic compartments are shown in the two cells in this fluorescence color image which was obtained by confocal microscopy. The endocytic recycling compartment, shown in red, is identified by a protein that it contains, fluorescent transferrin. This compartment has a compact morphology near the cell nucleus. The late endosome has a more dispersed punctate appearance, and is identified by a green fluorescent antibody against one of its resident proteins, the mannose-6-phosphate receptor. The lack of overlap between the two colors demonstrates that these proteins are in distinct, separate intracellular compartments. (Maxfield Laboratory)

DNA replication is studied by several investigators in the Program. Jerard Hurwitz's laboratory studies DNA replication of SV40 DNA and DNA replication within eukaryotic cells. Kenneth Marians uses purified proteins to determine the enzymatic mechanisms required for DNA replication and the role of topoisomerases in this process. Stewart Shuman's laboratory examines transcription termination processes and topoisomerase function. Scott Keeney uses biochemical and genetic approaches to investigate meiotic recombination in yeast and mammals.

Nucleic acid and organic chemistry are also actively investigated in the Program. Francis Barany studies protein-DNA interactions and uses protein engineering to study cancer. Hugh Robertson examines the structure and function of biologically-active RNA molecules. Paul Tempst develops methods for ultra-microsequencing of proteins.

Complete research descriptions can be found on the Graduate School website at www.med.cornell.edu/gradschool.

Program Requirements

Admission. Since the Biochemistry & Structural Biology Program offers training that emphasizes the chemistry of life processes and the relationship between biomolecular structures and their functional properties, admission to the Program requires a background in chemistry and biology that, minimally, represents courses in general, organic and physical chemistry and general biology, as well as evidence of comprehension of modern experimental physics and mathematics. Additional preparation in undergraduate biochemistry and cell biology is preferred. Students may remedy deficiencies in these areas during the summer before entering graduate school, or in some cases, during the first year of graduate study.

The Graduate Record Examination (including the advanced test in chemistry or biochemistry) is required. Applicants from abroad are, in addition, required to take the TOEFL examination.

Course of Study. Within the framework of degree requirements and in consultation with the student, the course of study is planned to fit the need of the individual. The curriculum is designed to provide a broad, general background in graduate biochemistry, molecular biology, and cell biology that is tailored to the needs and interests of each student.

Students entering the Biochemistry & Structural Biology Program are *required* to take the following courses:

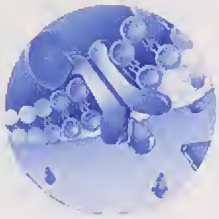
1. Biochemistry & Structural Biology
2. Cell Biology
3. Molecular Genetics
4. Biochemistry & Structural Biology Journal Club

In addition, students must also select four other elective courses, at least two of which must come from the advanced courses offered by the program. These courses change each year and the topics covered reflect the expertise of the faculty. In the past two years the special topic courses offered included: advanced courses in NMR, x-ray crystallography, and optical microscopy and spectroscopy, signal transduction RNA structure and function, and structural analysis of receptor ligand interactions. Students are also encouraged to take additional courses offered by the other Programs in the Graduate School that will strengthen their preparation for a career in research.

Laboratory Rotations: Entering graduate students must also rotate among three laboratories of faculty of their choice for three-month periods, allowing them to become familiar with the ongoing research activities of the Program, and aiding in their selection of a thesis project. It is expected that all students will choose a thesis laboratory following completion of their laboratory rotations.

Admission to Doctoral Candidacy Examination and Research Supervision: Upon choosing a thesis laboratory, a Special Committee will be constituted, which consists of the thesis mentor (known as a major sponsor) and two minor sponsors. There are two parts to the written portion of the exam. One part is a research proposal (NIH format) written by the student in an area unrelated to the thesis project. In addition, a short (2-3 page) thesis research proposal, stating the aims of the thesis project is required. This examination, normally given at the end of the student's second year, is designed to test the student's general proficiency in Biochemistry & Structural Biology. It contains both written and oral components and places emphasis on the student's ability to critically analyze and design appropriate approaches to solve various scientific problems. The student will not be formally admitted to Ph.D. degree candidacy until he or she has successfully passed The Admission to Doctoral Candidacy Examination.

Finally, completion of the Ph.D. in Biochemistry & Structural Biology requires an original thesis based on the student's research and a thesis defense.



Cell Biology & Genetics

Faculty

Rosemary F. Bachvarova
Craig T. Basson
Robert Benezra
Carl P. Blobel
Anthony M.C. Brown
Michael Caudy
Ethel Cesarman
Raju S.K. Chaganti
Nathan Ellis
Donald A. Fischman
Robert P. Fisher
Leonard P. Freedman
James L. German, III
Filippo G. Giancotti
Barry M. Gumbiner
Katherine A. Hajjar
Eric C. Holland
Maria Jasin
Paul A. Marks
Joan Massagué
Gero Miesenböck
Takashi Mikawa
Malcolm A.S. Moore
Joel D. Pardee
Marilyn D. Resh
Richard A. Rifkind
Hugh D. Robertson
Enriqué Rodriguez-Boulan
Neal Rosen
Urs Rutishauser
Roy L. Silverstein
Thomas H. Söllner
Lisa Staiano-Coico
Ching-Hwa Sung
Harold E. Varmus
John A. Wagner
Martin Wiedmann
Paul Wilson

Graduate Program Chairperson

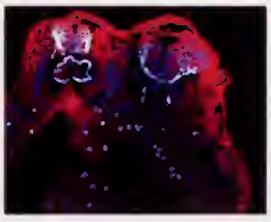
Joan Massagué, Cell Biology Program, Sloan-Kettering Institute, 1275 York Avenue, New York, NY 10021, (212) 639-8975.

Graduate Program Director

Urs Rutishauser, Cell Biology Program, Sloan-Kettering Institute, 1275 York Avenue, New York, NY 10021, (212) 639-8342, E-mail: u-rutishauser@ski.mskcc.org

Overview of Research Activities

The research interests of the Cell Biology & Genetics Graduate Faculty comprise a wide range of topics related to the control of normal and malignant cell growth and differentiation. Purified proteins, isolated cells and tissues, and whole organisms are all being exploited as model systems. A variety of molecular, cellular, and genetic techniques are being used to address the following questions: How is gene expression regulated? How are proteins folded and targeted to specific locations within the cell? How do cells interact and how does this influence tissue function? How is the growth of normal and transformed cells regulated at the biochemical and genetic level?



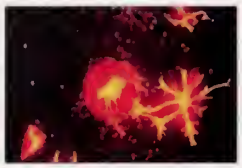
Section through a *Xenopus* embryo showing duplication of the spinal column by injection of beta-catenin mRNA (Gumbiner Laboratory)

Control of gene expression by helix-loop-helix proteins is being studied at the molecular level by Robert Benezra, who is interested in regulation of differentiation, and Michael Caudy, who is studying *Drosophila* neurogenesis. Leonard Freedman focuses on transcriptional control by nuclear hormone receptors.

The precise expression of tissue-specific proteins is critical for coordination of development and differentiation. Rosemary Bachvarova is studying the process of gastrulation in embryos. Several faculty are studying the molecular aspects of tissue formation, including muscle development (Donald Fischman), heart and brain differentiation (Takashi Mikawa) and epithelial differentiation (Lisa Staiano-Coico). Paul Wilson is studying the morphogenesis of the dorsal mesoderm and neural fates during frog (*Xenopus*) development.

The biochemistry of human tissue function is of great interest to many laboratories. Ching-Hwa Sung focuses on rod outer segment biology. Specific signaling pathways activated in endothelial cells (Katherine Hajjar), platelets, and phagocytes are being elucidated in an effort to understand the roles of these cells in human diseases.

The biosynthesis and targeting of proteins to specific subcellular locations is being addressed using biochemical and cytological techniques. Martin Wiedmann studies polypeptide chain synthesis on the ribosome. The laboratory of Enriqué Rodriguez-Boulan is involved in molecular and biochemical aspects of intracellular protein trafficking using cell-free systems, yeast, or polarized cells. Once proteins are targeted to specific locations, their ability to mediate cell-cell interactions at the



Primary cultures of astrocytes stained with anti-GFAP.

membrane is precisely controlled. Cellular adhesion by cadherins and catenins (Barry Gumbiner) and the monocyte protein CD36 (Roy Silverstein) as well as signaling by cell-surface integrins (Carl Blobel, Filippo Giancotti) are major research interests. Joel Pardee studies cell motility and cell division generated by the actin cytoskeleton.

Control of normal and malignant cell growth by oncogenes, growth factors, and the cell cycle are major research themes in the Cell Biology & Genetics Program. The laboratory of Paul Marks and Richard Rifkind studies growth and differentiation of erythroleukemic cells. Anthony Brown is interested in signaling by the Wnt family of oncoproteins, Neal Rosen is examining the role of tyrosine kinases in human breast and colorectal cancer, and Marilyn Resh studies the mechanisms of membrane binding and signaling by viral and cellular oncoproteins. The molecular mechanism of growth factor and receptor action is of interest to several laboratories, including neuronal growth factors (John Wagner), colony stimulating factors (Malcolm Moore), TGF b (Joan Massagué), and G protein coupled receptors. Cell cycle control is a major thrust of the laboratory of Robert Fisher and interfaces with the growth control mechanisms studies by several other faculty members (Marks, Rifkind, Rosen, Massagué).

Human genetic abnormalities at the chromosomal level are being studied with the goal of designing effective therapies to treat human diseases. Raju Chaganti uses cytogenic methods to identify genetic alterations in human tumors. James German's laboratory analyzes defects in Bloom's syndrome. Maria Jasin is developing gene targeting methodology to target chromosomal breaks, while Hugh Robertson is exploiting ribozymes to cleave harmful RNAs.

Complete research descriptions can be found on the Graduate School Website at www.med.cornell.edu/gradschool.

Program Requirements

Admissions: The Program in Cell Biology & Genetics offers advanced study leading to the Ph.D. degree. The program is intended to prepare students for a career in basic research and teaching in cell or developmental biology, genetics, molecular biology, or related disciplines. Students with a strong background in genetics, cell, molecular, or developmental biology are urged to apply.

The Graduate Record Examination (including the advanced test in biology, chemistry, biochemistry, or cell and molecular biology) is required. Applicants from abroad are, in addition, required to take the TOEFL examination.

Joint Curriculum: The Cell Biology & Genetics and Molecular Biology Graduate Programs offer a joint curriculum in Cellular, Molecular and Developmental Biology. Students entering both Programs will have the same course, laboratory rotation, and first year exam requirements, as well as the same Admission to Doctoral Candidacy Exam (ACE). These requirements are outlined below. Program affiliation will be determined by the choice of thesis laboratory, usually by the beginning of the second year.

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1. Molecular Genetics
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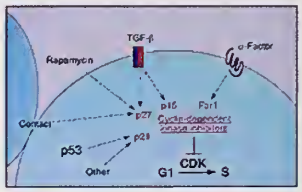
3. Cell Biology
4. Gene Structure and Function
5. Logic and Critical Analysis
6. Graduate Research Seminar



CDKs and CDK inhibitors. Cyclin-dependent kinases (CDKs) play a central role in allowing progression through the cell cycle. Their activity is suppressed by CDK inhibitors. Many inhibitory signals, such as those initiated by TGFb and contact in mammalian cells, by alpha mating factor in yeast, or by antiproliferation drugs such as rapamycin, arrest the cell cycle through CDK inhibitors. Many investigators in the Program are studying these pathways in normal and tumor cells. (Fisher, Freedman, Koff, Hurwitz, Massagué, Pavletich, Rosen Laboratories)

Students are expected to complete four quarters of electives before graduation.

The official transcript reports four grade levels (i.e., Honors (A), High Pass (B), Low Pass (C), and Fail (F)). Students are expected to perform at a level corresponding to a B average.

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Joint Program Retreat: Students have numerous opportunities to meet with the faculty, including faculty talks during the first year and a joint retreat held at a resort outside the New York City area, where faculty and students present and discuss their work.

Immunology

Faculty

Leif Bergsagel
Paolo Casali
Ethel Cesarman
Selina Chen-Kiang
Ellen Chuang
Mary K. Crow
Lisa R. Denzin
Bo Dupont
Ulrich Hämmerling
Alan N. Houghton
Lionel B. Ivashkiv
Philip King
Hsiou-Chi Liou
Kenneth O. Lloyd
Xiaojing Ma
Noel Maclaren
John Moore
William A. Muller
Henry W. Murray
Carl F. Nathan
Richard J. O'Reilly
Eric Pamer
Howard T. Petrie
David N. Posnett
Michel Sadelain
Jane E. Salmon
Derek B. Sant'Angelo
Elaine Schattner
Kendall A. Smith
Marc E. Weksler
Hao Wu
Marcel van den Brink
Jillian Zhang

Graduate Program Chairpersons

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Carl F. Nathan, M.D., Department of Microbiology & Immunology, Joan & Sanford I. Weill Medical College of Cornell University, 1300 York Avenue, New York, NY 10021, (212) 746-2985.

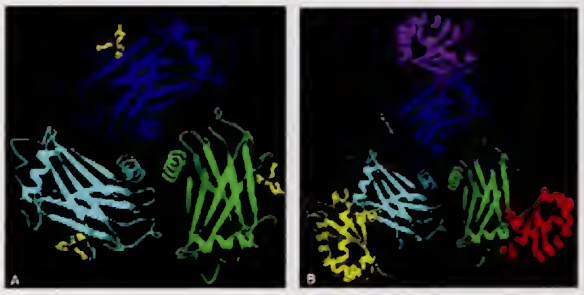
Graduate Program Director

Mary K. Crow M.D., Director of Immunology, Hospital for Special Surgery, 535 East 70th., Room 200, New York, NY 10021, (212) 606-1397, E-mail:crowm@hss.edu. The Graduate Program Coordinator is Terry Crespo. E-mail: crespot@mskcc.org, 212-639-7106.

Overview of Research Activities

Immunity is the ability of the inherited genome in a body to restrict the replication of the noninherited genomes in the same body, whether they arise exogenously by infection or endogenously by mutation as in cancer. This ongoing struggle forces host and pathogen to co-evolve, drives the host to undertake post-meiotic genetic recombination and self-mutation to diversify the molecules it can use for recognition, and leads to a panoply of mechanisms for attack and counterattack.

These elements combine to make Immunology an extraordinarily exciting discipline, whose study is facilitated by ready access to the only monodisperse, migratory cells in the postnatal mammal outside of gametes. These cells overcome distance and frequent shifts in locale to coordinate their behavior by releasing some of the most potent signaling molecules in nature. The Immunology Program brings together for research and teaching a diverse set of scientists who seek to understand how these remarkable genes, cells and molecules fight infection, cancer and grafted cells, and how they misfire to cause autoimmune disease.



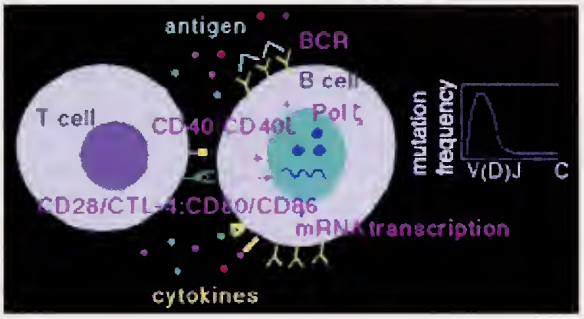
Structural basis of two alternative modes of TRAF signaling by direct receptor coupling and by indirect coupling via the adapter protein TRADD. (A) Crystal structure of the trimeric TRAF domain of TRAF2 (shown as ribbon drawings in blue, cyan and green) in complex with a peptide from TNF-R2 (shown as yellow sticks next to the cyan molecule). Residues involved in trimerization are also shown between the cyan and blue molecules . (B) Crystal structure of the trimeric TRAF domain of TRAF2 (shown in blue, cyan and green) in complex with the N-terminal domain of TRADD (shown in red, magenta and yellow). The trimeric nature of TRAF2, revealed by these structural studies, provides the mechanism by which TRAF proteins respond to receptor trimerization. (Hao Wu's lab).

One class of lymphocytes, T cells, develop in the thymus. Derek Sant'Angelo and Howard Petrie study how T cells develop, how they

are negatively and positively selected according to their predetermined ability to recognize antigen, and how their specificity affects their ability to protect the host from infection. Lisa Denzin investigates how antigens-presenting cells choose and display pieces of antigens for recognition by T cells. Other major classes of lymphocytes, B cells and antigen presenting cells, arise in the bone marrow. Paolo Casali studies how B cells rearrange and mutate the genes that encode their secreted antigen receptors, called antibodies.

Cells in the immune system regulate each other by releasing signaling proteins called cytokines. Kendall Smith focuses on the role of interleukin-2 in activation and proliferation of lymphocytes and natural killer (NK) cells, while Xiaojing Ma analyzes how interleukin-12 regulates the development of protective cell-mediated immunity. Cytokines as well as cell surface molecules effect cell function through specialized signal transduction pathways. Lionel Ivashkiv and Jillian Zhang study the Jak-STAT signaling pathway in transcriptional activation and inflammatory diseases. Hao Wu uses structural biology to define the interactions of signal transduction elements in the family of tumor necrosis factor receptors. The primary objective of Hsiou-Chi Liou's research is to understand the role of the components of the NF-kB proteins in signaling lymphocyte activation and differentiation. The role of interleukin-6 and other cytokines in the terminal differentiation of B cells is addressed by Selina Chen-Kiang. Ulrich Hammerling studies the role of vitamin A and its metabolites in lymphocyte signaling and differentiation. Co-receptors and inhibitory receptors on T cells and NK cells such as CD28, CTLA-4 and KIRs also signal through specialized pathways. These are under investigation by Philip King, Ellen Chuang and Bo Dupont.

William Muller addresses the biology of adhesion molecules responsible for the binding and emigration of leukocytes across vascular endothelium. Carl Nathan's research is focused on the molecular mechanisms whereby neutrophils and macrophages kill infectious organisms such as the tubercle bacillus. Henry Murray studies how T cells and macrophages cooperate to produce cytokines that limit replication of a protozoan pathogen, *Leishmania*. David Posnett and John Moore study the immune response to the human immunodeficiency virus (HIV).



Ig gene hypermutation in B cells. Induction of Ig hypermutation requires engagement of B cell antigen receptor for antigen (BCR) and co-engagement of CD40 and CD80/CD86 by CD154 (CD40L) and CD28/CTLA-4 on T cells. BCR engagement transduces a signal that modulates expression of DNA polymerases of the translesion UmuC/DinB/Rev/Rad30 family and in particular polymerase zeta and polymerase eta. This results in introduction of base mismatches, i.e., point-mutations, in Ig variable genes and the bcl-6 transcriptional repressor. (Paolo Casali's lab).

Alan Houghton studies the host immune response to cancer cells and is developing vaccines to immunize the host. Kenneth Lloyd studies the biochemical synthesis and nature of tumor antigens and has developed monoclonal antibodies against these antigens. Elaine Schattner addresses the dysregulation of apoptotic mechanisms in lymphomagenesis. Leif Bergsagel studies the molecular biology of neoplastic transformation in human plasma cells that lead to myeloma. The role of human herpesvirus (HHV)-8 in lymphoid transformation is the focus of Ethel Cesarman's research.

Mary Crow examines the T cell repertoire in autoimmune diseases and T cells ligands that regulate B cell activation and death. Noel Maclaren studies the role of autoimmunity in diabetes. Receptors for immune complexes of antigen and antibody profoundly affect the biology of phagocytic cells in autoimmunity, as studied by Jane Salmon. Changes in the immune system that occur during aging are Marc Weksler's focus.

Richard O'Reilly and Marcel van den Brink study graft-versus-cancer reactions and graft-versus-host disease (GVHD), a complication of bone marrow transplantation, and are developing therapeutic strategies to prevent and treat this disease. Michel Sadelain is developing gene therapy approaches to GVHD as well as other genetic diseases using retrovirus vectors.

Complete research descriptions can be found on the Graduate School Website at www.med.cornell.edu/gradschool.

Program Requirements

Admission: Applicants should have a strong undergraduate background and record of achievement in the biological sciences, including biochemistry, molecular genetics, and microbiology, and are also expected to have undergraduate laboratory research experience. An official transcript of the student's undergraduate record is necessary with at least two letters from faculty members who can evaluate the academic potential of the student in a Ph.D. program in Immunology. The application requires a personal statement describing the student's background and specific interest in the Immunology Program. Applicants must submit the results of the Graduate Record Examination, including the advanced test in Biology or Chemistry. Students from abroad are required to take the TOEFL examination.

Curriculum: An individual program of didactic study is developed for each student on the basis of the student's interest and prior experience, comprising both required and elective courses.

Course Requirements: Students entering the Immunology Program are required to take the following courses.

1. Fundamental Immunology (Q 1-4, first year)
2. Immunology Graduate Research in Progress (Q 1-4, all years)
3. Seminars in Immunology (weekly, all years)
4. Cell Biology (Q 3-4, first year)
5. Molecular Genetics (Q 1-2, first year)*
6. Eukaryotic Gene Structure and Function (Q 3-4, second year)*
7. Biochemistry and Structural Biology (Q 1-2, second year)*
8. Biostatistics (Q 1, second year)
9. Advanced Topics in Immunology, at least 3 modules to be chosen among topics such as: Signal Transduction, B Cells, Natural Immunity, Apoptosis, Tumor Immunology, Developmental Immunology (Q 1-4, all years)

*The student must take one of the three courses marked by an asterisk. Eukaryotic Gene Structure & Function can be taken in the first year with approval from the program Director.

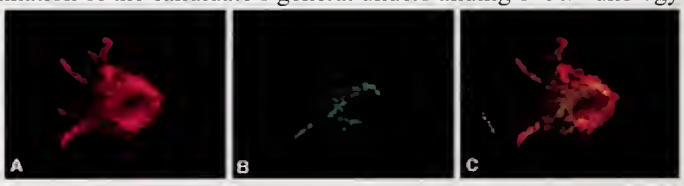
The student with the help of the lab head must participate regularly in journal clubs throughout the graduate training. He/she may chose elective courses among all courses offered by the other Programs of the Graduate School.

The Immunology Program offers a series of colloquia on current topics in Immunology with discussions led by Immunology faculty members. In addition, a wide variety of research seminars by outside speakers are offered throughout the year. The Immunology Annual Retreat in Lake Mohonk, New York is an integral part of the program. It includes formal presentations by faculty, graduate students and postdoctoral fellows. In addition, it requires graduate students (from year 2 on) and postdoctoral fellows to contribute to poster sessions and workshops. Prizes are awarded to the graduate students and postdoctoral fellows who give the best oral and poster presentations.

Laboratory Rotations: The main focus of the Graduate Program in Immunology is on laboratory research. Each student is required to undertake three rotation projects with different faculty members. The three rotations will be carried out during the third and fourth quarters of the first year and the summer following the first year of study. During the second year, the student is expected to choose a thesis sponsor and to develop a major research proposal for the doctoral thesis.

Admission to Doctoral Candidacy: The Admission to Doctoral Candidacy Examination which is ordinarily taken in the spring of the second year, requires both written and oral examination of the candidate's general understanding of immunology and related subjects.

Special Committee: A Special Committee, comprised of the faculty member directly supervising the student's thesis research ("Major Sponsor") and two additional faculty members knowledgeable in the field of study ("Minor Sponsors") advises the student in his or her research, meeting periodically to monitor progress, and upon completion, to certify the thesis as an official piece of research that satisfies the requirements of the graduate school for the Ph.D. degree. During that time the student will continue to participate in the other educational programs offered by the graduate program but will work full time in the laboratory.



Co-localization of MHC class II and H2-M in murine bone-marrow-derived dendritic cells. Immature dendritic cells were permeabilized and stained with a monoclonal antibody specific for class II molecules (anti-A^k) (A), a rabbit anti-sera specific for the H2-M heterodimer (B) or co-stained with both antibodies (B). Primary antibodies were detected by the addition of Texas Red coupled goat anti-mouse (class II) and FITC-coupled goat anti-rabbit (H2-M). (Lisa Denzin's lab).

Molecular Biology

Faculty

Kathryn Anderson	Erik Falck-Pedersen	Andrew Koff	Carl F. Nathan	Beate Schwer
Francis Barany	Lorraine J. Gudas	Elizabeth Lacy	Lee Ann Niswander	Stewart Shuman
Mary Baylies	William K. Holloman	Neal Lue	Pier Paolo Pandolfi	Paul Tempst
Peter Besmer	Jerard Hurwitz	Kenneth J. Marians	Mark Ptashne	Pengbo Zhou
Anthony M. C. Brown	Scott Keeney	Pamela Meluh	Luis E. N. Quadri	

Graduate Program Chairpersons

Erik Falck-Pedersen, Department of Microbiology & Immunology, Joan and Sanford I. Weill Medical College of Cornell University, Room B-309, 1300 York Avenue, New York, N.Y. 10021, (212) 746-6505.

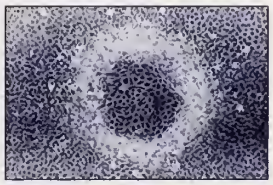
Kenneth J. Marians, Molecular Biology Program, Sloan-Kettering Institute, Room 1101A, Rockefeller Research Laboratories, 430 E. 67th Street, New York, NY 10021, (212) 639-5890.

Graduate Program Director

Lee Niswander, Molecular Biology Program, Sloan-Kettering Institute, Room 1017-E, Rockefeller Research Laboratories, 430 East 67th Street, New York, N.Y. 10021, (212) 639-2354, E-mail: l-niswander@ski.mskcc.org

Overview of Research Activities

Regulation of cell growth is a shared and unifying research interest to members of the Molecular Biology Graduate Program. The molecular pathways involved in control of cell growth have proven to be remarkably intricate, tying together nearly all the fundamental processes of cellular metabolism. For example, the products of oncogenes, tumor-suppressing, and tumor-enhancing genes have been discovered to participate in pathways as seemingly diverse as signal transduction, repair of damaged DNA, regulation of gene expression, and control of the cell cycle. The research efforts of the faculty of Molecular Biology can be grouped under three broad topics: i) mechanisms of differentiation, growth control, and development ii) mechanisms of DNA replication, DNA repair, chromosome maintenance and iii) transcriptional control of gene expression and mRNA biosynthesis.



A ring of transformed mammary epithelial cells induced by growth of the cells in proximity to a central colony of fibroblasts expressing Wnt-1 protein. (Brown Laboratory)

Signal transduction is a critical step in the control of cell growth and proper developmental regulation. *Drosophila* is used as a model system to analyze development by Kathryn Anderson, who studies the manner in which the maternal-effect genes regulate pattern formation in the developing embryo and Mary Baylies, who is investigating how the *Twist* gene product controls cell fate determination in the mesoderm. Another major experimental system for the study of development is the mouse. Elizabeth Lacy has been isolating genes required for early development, whereas Pier Paolo Pandolfi has constructed mouse strains inactivated in genes known to be involved in the development of acute promyelocytic leukemia. Andrew Koff has developed a mouse model system that allows him to study the effects of deregulation of cell cycle control in a complex organism. In a related system, Lee Niswander studies the interaction of the genes that specify pattern formation in the chick limb. How activated receptor complexes transmit information to control the growth state of a cell is under study by several investigators. Peter Besmer studies the mechanism of action of the c-*kit* receptor tyrosine kinase, whereas Lorraine Gudas is interested in the effects of retinoids on cell growth. Anthony Brown is elucidating the intracellular signaling pathways through which the Wnt family of proteins act. Often, only very small amount of proteins involved in these pathways are available for analysis. Paul Tempst develops methods for ultra-microsequencing of proteins.

Top Figure BMP signaling is required for cell death between the embryonic digits. Left panel illustrates Bmp RNA expression in the interdigital spaces (purple stain marked by arrows). Right panel, right limb: interdigital cells do not die when BMP signaling is blocked by a mutation in the BMP receptor, thus leading to webbing between the digits.
Bottom Figure The mouse mutation limb deformity causes loss and fusion of bones and digits of the arm and leg. At early stages of limb development, this is manifested by alterations in gene expression as demonstrated by Fgf4 RNA expression (a,b) and by aberrant apical ectodermal ridge formation as illustrated by scanning electron microscopy (c,d).
(Niswander Laboratory)

The biological mechanisms that mediate chromosome duplication are addressed in a variety of systems ranging from bacteria to humans. Kenneth Marians is investigating the protein-protein interactions required to make the *E. coli* replisome a super efficient protein machine. Jerard Hurwitz is defining the proteins required for eukaryotic replication and how they interact with the cell cycle machinery. The molecular basis of DNA recognition by DNA binding proteins is under study in Francis Barany's lab. Several laboratories are combining the power of genetics and biochemistry to study aspects of DNA metabolism. The enzymatic machinery involved in repairing damaged DNA is studied in the laboratory of William Holloman . Scott Keeney is characterizing the genes and mechanisms that are essential to chromosome rearrangement during meiosis. Pamela Meluh is interested in the biology of the centromere-kinetochore complex involved in chromosome segregation during mitosis, and Neal Lue is dissecting the enzymatic machinery required for telomere maintenance and replication in yeast.

Basic aspects of gene expression are studied by a number of different investigators. The nature of protein/protein complexes which bind to DNA and act as transcriptional regulators is studied by Mark Ptashne. Using a variety of model systems several laboratories are studying the essential pathways of mRNA processing. Stewart Shuman investigates the enzymatic mechanisms of transcription initiation, elongation, and termination using yeast and *Vaccinia* virus as a model. Beate Schwer uses yeast genetics and biochemistry to dissect the biochemistry of mRNA splicing. Eric Falck-Pedersen uses another eukaryotic virus, adenovirus, as a model to study gene transduction and regulation of mRNA 3'-end formation in mammalian transcription units.

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Program Requirements

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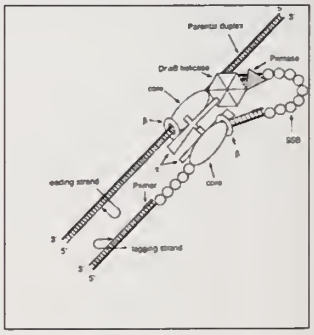

Protein-protein interactions between the t subunit of the DNA polymerase III holoenzyme and the replication fork helicase, DnaB, defines the leading-strand polymerase. (Marians Laboratory)

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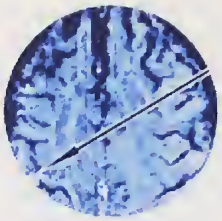

Neuroscience

Faculty

Sue A. Aicher	Daniel Gardner	Charles E. Inturrisi	Michael I. Posner	Miklos Toth
Harriet D. Baker	James Gibbs	Tong H. Joh	Keith Purpura	Rosario R. Trifiletti
M. Flint Beal	Gary E. Gibson	Lonny R. Levin	Enriqué Rodriguez-Boulan	Johathan D. Victor
John Blass	Eugene V. Golanov	Teresa A. Milner	James E. Rothman	Bruce T. Volpe
Ronald G. Blasberg	Steven A. Goldman	Dimitar B. Nikolov	Urs Rutishauser	John A. Wagner
Susan E. Browne	Bernice Grafstein	Michiko Okamoto	Timothy A. Ryan	
Michael A. Caudy	Neil L. Harrison	Gavril W. Pasternak	Thomas H. Söllner	
Arthur J. L. Cooper	Barbara L. Hempstead	Virginia M. Pickel	Jin H. Son	
Robert Duvoisin	Joy Hirsch	Fred Plum	Lorenz P. Studer	
Donald A. Fischman	Xin-Yun Huang	Jerome B. Posner	Ching-Hwa Sung	

Graduate Program Chairperson

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Graduate Program Director

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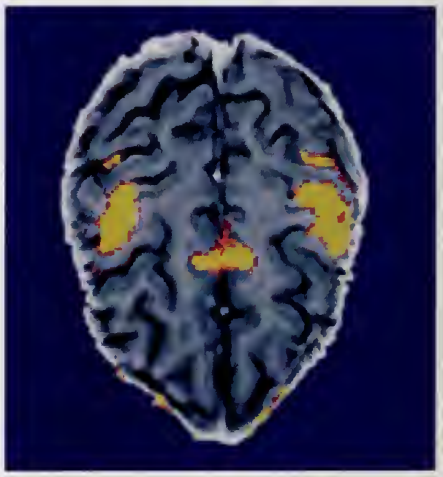
Overview of Research Activities

The unifying theme of the Program in Neuroscience is a common interest in the development and function of the nervous system. Members of the Program in Neuroscience study the development, structure, and function of the nervous system, using a wide variety of scientific disciplines, including molecular genetics, biochemistry, pharmacology, neuroanatomy, electrophysiology, molecular biology, computational neuroscience, and behavior. They work at the molecular, cellular, and organismal levels, targeting the nervous system in rodents, birds, *Drosophila*, reptiles, and *Aplysia*, as well as in humans. The research interests of the program cover the entire range of neuroscience, including the regulation of neural development, neuronal plasticity, control of neurotransmitter synthesis & release, learning, the response of neurons and neural tissue to injury, the regulation of gene expression, endocrine function, vision & other sensory systems, information processing, and behavior. Many members of the program have a special interest in questions that are particularly relevant to human disease, and their research has important implications for topics such as the regulation of pain, neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease, neural tumors, stroke, addiction, and aging. The research interests of the faculty can be grouped into nine major areas including: 1) developmental neurobiology, 2) neurotransmitter release & presynaptic function, 3) signaling through neurotransmitter receptors, 4) signaling by growth factors and molecules in the extracellular matrix, 5) integrative neuroscience, 6) behavior, 7) metabolism and neurotoxicology, 8) vision, and 9) neural disease: but individual faculty frequently having interests in more than one of these areas.

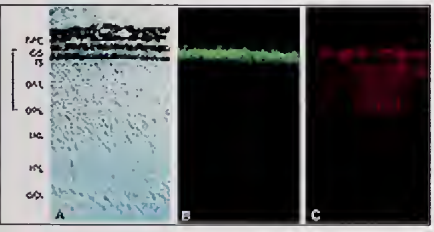


Functional magnetic resonance imaging reveals regions of the human brain that are neurally active during performance of specific tasks. This figure shows a typical functional brain response when the subject performs a bilateral finger/thumb tapping task. The brain areas that are active (yellow) identify motor (anterior lateral), sensory (posterior lateral) and supplementary motor (medial) areas that participate in these hand movements. This new ability to map brain functions opens many new opportunities to investigate and understand the human brain. (Hirsch Laboratory)

Developmental Neurobiology. The development of molecular markers for specific cell types and the isolation of genes that control developmental process have opened new frontiers in developmental neurobiology. Harriet Baker studies the factors responsible for the maintenance of neural phenotype in the olfactory system and John Wagner studies the role of peptide growth factors in the visual system. Michael Caudy studies the role of basic helix-loop-helix proteins in the development of the *Drosophila* nervous system. John Wagner and Michael Caudy are collaboratively studying the role of bHLH proteins, especially HES-1, in the development of vertebrate nervous system. Steve Goldman has developed methods of studying neurogenesis in the adult vertebrate and the way they migrate into the CNS and form functional connections. Jin Son is using promoter analysis to determine the factors that control differentiation of specific cell population in the nervous system. Donald Fischman is interested in the development of the neuromuscular junction. Tong Joh is using neural specific promoters to understand regulated transcription in the nervous system and as tools to understand how inappropriate gene expression can perturb developmental processes. Barbara Hempstead studies the role of neurotrophin receptors in the development of the neural crest and the retina. Urs Rutishauser investigates cell-cell interaction in the nervous system with a special interest in the role of neural cell adhesion molecules (NCAMs) and polysialic acid on neural migration and axon guidance. Bernice Grafstein studies axonal transport and regeneration as well as the development of the pia-arachnoid, which helps provide an appropriate environment for neural development. Dimitar Nikolov studies structure and function of axon guidance molecules, including ephrins, netrins, and semaphorins and their receptors.

Neurotransmitter Release & Presynaptic Function. Regulation of the rate of neurotransmitter release is a key regulator of information processing in the nervous system. James Rothman, who first reconstituted vesicle fusion in vitro, is studying the molecular components of the core machinery for vesicle docking, vesicle fusion and vesicle recycling during neurotransmission. Tim Ryan uses optical techniques to study the fundamental mechanism of neurotransmitter release. Thomas Söllner focuses on the role of SNARE proteins in vesicle docking and fusion and the role of SNARE proteins in maintaining vesicle flow, axonal transport, and neuronal polarization. Robert Duvoisin is studying the role of presynaptic glutamate receptors on transmitter release.

Signaling by Neurotransmitters and Receptors. The study of signaling among neurons and between neurons and other cells lies at the heart of neural functioning, so nearly all laboratories have an interest in this area; but several of our faculty focus strongly on the action of neurotransmitters and their receptors. Charles Inturrisi and Gavril Pasternak are interested in the neuropharmacology of the opiates and their receptors. Xin-Yun Huang studies the ways GTP binding proteins and tyrosine phosphorylation are involved in transmitter signaling. Robert Duvoisin studies glutamate receptors, especially metabatropic glutamate receptors, while Miklos Toth introduces germ line mutations into serotonin receptors to study their function. Timothy Ryan uses optical techniques to study the fundamental mechanism of neurotransmitter release. Thomas Söllner focuses on the role of SNARE proteins in maintaining vesicle flow, axonal transport, and neuronal polarization. Rosario Trifiletti, and John Wagner, have a special interest in signaling by nitric oxide in the nervous system. Lonny Levin is interested in signal transduction by various forms of adenylate cyclase in *Drosophila* and vertebrate systems, as well as the role of cAMP in cross talk among receptor systems. He recently isolated a novel soluble adenylate cyclase. Dimitar Nikolov uses X-ray crystallography to study the structure of ion channels and receptors in the nervous system.



Double immunofluorescent labeling of wild-type rhodopsin (B) and truncated rhodopsin (C) in transgenic retinas. Note that the truncated rhodopsin is defective in its outer segment (OS) localization in photoreceptors. (Sung Laboratory)

The Structure of the Nervous System and Neuroanatomy. Understanding signaling among neural cells is greatly facilitated by understanding the connections among nerve cells at the anatomical level, an approach used by many members of the program. Notably, Virginia Pickel is targeting opioid and catecholamine receptors and neurotransmitter transporters in basal ganglia, and their implications for reward and addiction. Teresa Milner is elucidating receptor selectivity of the transmitter components of the septohippocampal pathway that underlies learning and memory. Sue Aicher is interested in the cellular sites for activation of glutamate and opioid receptors in regions involved in pain and autonomic control. Eugene Golanov is studying the cellular mechanism and neuronal pathways by which the brain senses and responds to hypoxia and in central neural mechanisms governing the cerebral circulation.

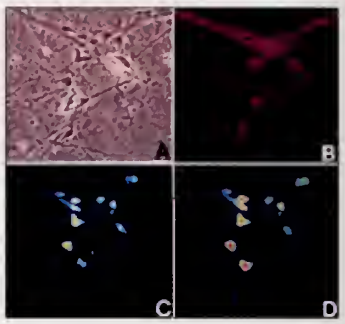
Signaling By Growth Factors. Many aspects of the development and maintenance of the nervous system is controlled by cell-cell interactions, many of these are mediated by peptide growth factors signaling. Barbara Hempstead is determining the role of adapter proteins that mediate interactions between neurotrophin receptors and intracellular responses in several tissues, including neurons and the cardiovascular system. John Wagner is interested in the role of the rho family of GTP-binding proteins in mediating the morphological responses to NGF and the transcription factors, including bHLH proteins regulated by NGF.

Integrative Processes. Keith Purpura is interested in how attention influences cortical processing and how neural assemblies can represent the external world and influence behavioral tasks. Michael Posner together with B.J. Casey uses high density electrical recording and fMRI to study the development of attentional systems. Fred Plum uses imaging and cognitive approaches to elucidate the cerebral processes involved in conscious processes. Jonathan Victor studies signal processing and information coding in the nervous system. Gero Miesenböck has developed genetically encoded optical probes that he is using to visualize and understand functional neural circuits. Daniel Gardner combines neurophysiology and artificial intelligence to elucidate the principles used to form neural networks. He also develops computer databases and programs to promote information exchange among scientists and to facilitate integration of neuroscience data. Joy Hirsch uses fMRI, which measures changes in oxygen use in the brain to map the response of the human brain, to sensory stimuli or to behavioral tasks.

Behavior. Since the ultimate purpose of the nervous system is to regulate behavior, several members of the program are attempting to determine the structural and biochemical basis of behavior. James Gibbs, is interested in the regulation of feeding behavior, including its regulation by neuroendocrine function, neuropeptides, and dietary fat. Miklos Toth takes a genetic approach to determine the roles of dopamine and serotonin receptors on anxiety, depression, and related disorders.

Metabolism and Neurotoxicology. Arthur Cooper is interested in neurotoxicology, amino acid metabolism, and energy production in Alzheimer's Disease and during ischemia. John Blass studies inborn errors of metabolism, especially defects that contribute to the development of Alzheimer's disease. Rosario Trifiletti has a clinical interest in the metabolic basis of inherited diseases in children. Flint Beal is dissecting the neurotoxic activities of MPTP and 3-nitroproprionic acid. Gary Gibson has discovered fundamental differences that distinguish cells of Alzheimer's patients. He studies the role of chronic metabolic insults in the production of selective neural damage (i.e., selective vulnerability) in animal models.

Vision. The visual system is a premier system to study sensory processing in both the retina and the brain. Members of the Dyson Vision Institute, directed by Enriqué Rodriguez-Boulan have a special interest in this area. Work in vision research is supported by an NIH training grant, which provides support for several students. Ching-Hwa Sung is interested in the molecular mechanism used by photoreceptors to target opsin in photoreceptors and related sorting mechanisms that establish polarity in neurons and epithelial cells. Robert Duvoisin is studying a negative feedback regulation of glutamate released by photoreceptors, the signal transduction pathway that generate the 'on and 'off' pathways and he is generating mice with mutations in a novel receptor that he has isolated. Enriqué Rodriguez-Boulan focuses on how the retinal pigment epithelium promotes photoreceptor survival and how its dysfunction causes retinal degeneration. John Wagner is determining the roles of growth factors in the retina development and injury. Jonathan Victor is interested in processing of visual information in both the retina and the cortex. Keith Purpura is interested in communication among the cortical areas involved in processing visual information. Joy Hirsch uses functional MRI to understand how individual areas of cortex are involved in the processing of visual information.



Newly generated neurons from adult human temporal lobe in phase contrast (A) and after immunostaining for the neuronal protein MAP-2 (B). After loading with the calcium indicator dye fluo-3 (C), depolarization increases fluorescence (D). (Goldman Laboratory)

Neural Disease. The majority of the faculty in the program have strong interests in human neurological disease, and research in this area is fostered by the Institute for Human Neuroscience and the NIH training Grant, 'Molecular Mechanisms of Neurological Disease,' which is directed by John Wagner and Flint Beal. Flint Beal studies mechanisms of neurodegenerative disease, including Alzheimer's disease, Huntington's disease, Parkinson's disease, amyotropic lateral sclerosis, and stroke. John Blass is interested in the molecular basis of Alzheimer's disease and neural degeneration. Michael Caudy is mapping genes that contribute the neurodegeneration. Ching-Hwa Sung is interested in the retinal dystrophies which cause blindness, especially how defects in protein targeting contribute to this pathology.

A large number of investigators are interested in stroke and cardiovascular disease. Bruce Volpe studies the effect of ischemia and trauma on pathological processes and changes in brain structure and function. He is also determining the effects of robot-assisted training on recovery in stroke patients. Gary Gibson is interested in signal transduction and oxidative processes in the neurodegeneration associated with Alzheimer's Disease, ischemia, and metabolic disease. Rosario Trifiletti, and John Wagner are interested in the role of nitric oxide in neural degeneration after ischemia. Rosario Trifiletti studies the glutamate cascade of excitotoxicity, and he is also interested in the role of nitric oxide in multiple sclerosis and acute myotrophic lateral sclerosis. John Wagner discovered the protective roles of growth factors during nitric oxide toxicity. Eugene Golanov studies the neural regulation of blood flow and energy utilization in the brain and its response to hypoxia. Tong Joh is developing neuroprotective agents to minimize damage after stroke.

The neurobiology of cancer presents several problems that sets it apart from other forms of this disease. Jerry Posner studies the antigenic responses to cancer that induce neural degeneration (para-neoplastic syndromes). Ronald Blasberg uses Positron Emission Tomography (PET) to image brain tumors and to study tumor phenotype. He combines gene transfer technology

and imaging of reporter gene expression to elucidate cellular and molecular processes including signal transduction and the expression of therapeutic genes. Michael Caudy studies the expression and function of transcription factors that control differentiation along the neural lineage in neuroblastoma.

Miklos Toth uses genetic approaches to generate animal models of disease. His primary interest is the serotonergic system, which is associated with anxiety disorders, obsessive compulsive behavior, and aggressiveness in humans. He is also studying a transgenic model of epileptic seizure. Rosario Trifiletti is also interested in epilepsy, and has shown that nitric oxide plays a role in the onset of seizures. Jin Son is using neuron specific promoters to develop animal models of neurodegenerative disease and to produce neural tumors and cell lines in targeted neural populations.

Many faculty are interested in drug abuse and the use of opiates for the control of pain. These efforts are supported by a training grant that is directed by Charles Inturrisi, which also supports several students. Michiko Okamoto is interested in the neuropharmacological basis of alcohol, benzodiazepine and barbiturates. Ronald Blasberg uses PET to image opioid receptors, while Virginia Pickel and Teresa Milner study the localization of opiate peptides and their receptors at the ultrastructural level. Charles Inturrisi and Gavril Pasternak focus on the molecular basis of opiate receptor function, tolerance, and dependence.

Complete research descriptions can be found on the Graduate School Website at www.med.cornell.edu/gradschool.

Program Requirements

Mission: The Graduate Program in Neuroscience is a multi-departmental, multi-disciplinary effort by faculty, students, and fellows to provide an outstanding education in neuroscience. We believe that graduate education is an important step on a career pathway that may be in academics, a specialized research institute, the pharmaceutical or biotechnology industries, government, business, or education. We expect our graduates to be able to think independently and creatively, to have a demonstrated ability to make important discoveries, and to communicate their ideas effectively.

Admission: Applicants to the program are expected to have had thorough undergraduate training in biology, organic chemistry, physics, and mathematics. Students entering this program after attaining an M.D. or a Masters' degree can have a modified educational program. Graduate Record Examination scores, transcripts, and supporting letters must be submitted with the application. Candidates considered for admission are invited to visit the program.

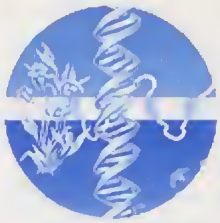
Course of Study: The program of research, course work, seminars, and independent study is individualized. Students are expected to spend time working closely with members of the faculty whose research approach is complementary to their interests. There are regularly scheduled seminars where work in progress is presented and discussed. By these means, the students are afforded the broadest possible view of the neurosciences during their graduate training.

Depending on their background and interests, students will be expected to take a course both in basic neuroscience and at least one upper level course in cell biology, molecular biology, biochemistry, or pharmacology. The Neuroscience Program offers courses in molecular, biochemical, cellular, and systems neurobiology. Students will select advanced graduate courses in the neurosciences and related fields and undertake independent study to deepen their knowledge in areas of interest and develop a minor specialty. There is sufficient flexibility in choosing elective courses that students may specialize in a particular area(s), including molecular neurobiology, developmental neurobiology, systems neuroscience, neuropharmacology, or neurophysiology. Throughout their training, students are expected to participate in the weekly, 'Progress in Neuroscience' seminar series and the seminar companion course, 'Current Topics in Neurobiology.'

Each year, the program organizes an academic retreat which includes talks, poster sessions and discussions. This retreat provides an informal setting away from the city where members of the program can interact and discuss their work. Senior students also present their work at the student organized du Vigneaud Symposium and the Progress in Neuroscience Series.

Laboratory Rotations and Thesis Research: Laboratory rotations allow students to experience research first-hand and to acquaint themselves with the research faculty of the Program. Students are expected to do two rotations of about two quarters each, but may do more rotations, before choosing their thesis advisor. Thesis research is guided by the student's major sponsor and a committee that includes at least two additional faculty.

Admission to Doctoral Candidacy: Before the end of the second year, students will organize a special committee and take the qualifying (Admission to Candidacy) exam. In the Neuroscience Program, this exam is a defense of both the thesis research proposal and an original non-thesis research proposal.



Pharmacology

Faculty

Joseph R. Bertino	David W. Golde	Charles E. Inturrisi	Gavril W. Pasternak	Hazel H. Szeto
Jochen Buck	Steven S. Gross	Richard N. Kolesnick	Marcus M. Reidenberg	Miklos Toth
Walter W.Y. Chan	Lorraine J. Gudas	Roberto Levi	Arleen B. Rifkind	C. Wilson Xu
Samuel Danishefsky	Neil L. Harrison	Lonny R. Levin	David A. Scheinberg	
Diane Felsen	Hugh C. Hemmings, Jr.	Michiko Okamoto	Francis M. Sirotnak	

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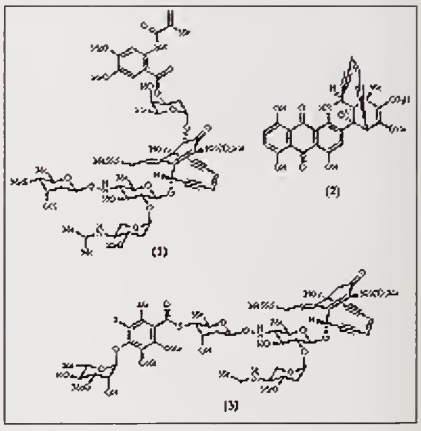
Overview of Research Activities

The research activities of the Pharmacology Program are directed at understanding how drugs and chemicals modify biological systems. Drugs can act at many different levels of organization. At the level of gene expression Dr. Gudas is learning how derivatives of vitamin A (retinoids) regulate both cellular differentiation and cellular proliferation during development and in the processes of tumor formation. Dr. Bertino is examining the role of oncogenes and tumor suppressor genes in the development of chemotherapeutic drug resistance. Dr. Xu has developed techniques to measure protein-protein interactions, and inhibitors of these interactions. Dr. Sirotnak focuses on the molecular mechanism of acquired resistance to antineoplastic agents which has led to the discovery of a new and highly potent analog of methotrexate. Dr. Toth has identified a gene involved in epilepsy and is studying how dysfunction of this gene leads to this disease; he is also creating transgenic mouse models to study other types of neurological diseases.



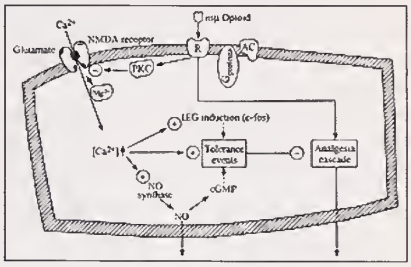
Based upon labeling experiments, the confirmed precursors for the postulated polyketide-based enediynes esperamicin (1), dynemicin (2), and calicheamicin (3) include acetate, methionine and sulfate. (Thorson Laboratory)

Often the actions of drugs are mediated by specific receptors located on the cell surface or intracellularly. Dr. Pasternak is using molecular and biochemical techniques to characterize the receptors for analgesic drugs such as morphine. Dr. Inturrisi has found that NMDA receptor antagonists are able to prevent morphine tolerance and is examining how this receptor and the opioid receptors interact. Dr. Scheinberg is using monoclonal antibodies as drugs that specifically target sites on tumor cells while Dr. Golde studies how cytokines regulate blood cell formation and the role of glucose transporters in neoplastic blood cells.

Receptors are linked to intracellular events by signal transduction pathways. Dr. Kolesnick has discovered a new signal transduction pathway, the sphingomyelin pathway, and is identifying how this pathway signals in response to receptor activation. Dr. Levin is investigating the biological role of individual isoforms of the second messenger, adenylyl cyclase, in

learning and memory in Drosophila while Dr. Gross is defining the actions of another intracellular messenger, nitric oxide, which mediates vascular homeostasis and regulates blood pressure . Dr. Rifkind is investigating how a cytoplasmic receptor for dioxin controls the expression of certain enzymes (cytochrome P-450s) and how this results in the diverse toxicity of dixons and the polychlorinated biphenyls (PCBs). Dr. Buck has characterized two new intracellular messenger molecules, 14-hydroxy-retro-retinol and anhydroretinol and is studying their roles in the cell cycle and in malignant cells.

At the systems level, Dr. Levi is examining the role of a novel histamine receptor subtype (the H3-receptor) found in human heart and activated in myocardial ischemia. Dr. Chan is searching for new drugs to prevent premature birth from among a group of selective oxytocin receptor antagonists. Dr. Szeto is developing novel opioid drugs for use as obstetrical analgesics. The drugs are evaluated for their effects on the mother and the fetus. Dr. Felsen is examining the mediators of inflammation in the genito-urinary tract, the receptors involved and how new drug therapies can be designed for renal and bladder diseases. Dr. Hemmings is interested in the critical role played by protein phosphorylation in the effects of general anesthetics on synaptic transmission while Dr. Okamoto is involved in the development of new muscle relaxants for use during anesthesia. Dr. Reidenberg's clinical pharmacological studies are aimed at understanding the sources of variation in drug responses. He is evaluating the mechanisms of the antineoplastic and antifertility effects of gossypol.



A model that presents some of the receptor-mediated signal transduction events that may be involved in the attenuation of morphine (mm) tolerance by NMDA receptor antagonists. (Inturrisi Laboratory)

Complete research descriptions can be found on the Graduate School Website at www.med.cornell.edu/gradschool.

Program Requirements

Admission: A baccalaureate degree with a strong background in the natural sciences and/or health sciences is required for admission. Results of the Graduate Record Examination (verbal, quantitative and analytical) are required for Ph.D. applicants, while results of the advanced test in Biology or Chemistry are strongly recommended.

Course of Study: In the first two years, students are required to complete the following core curriculum courses:

1. Cell Structure and Function
2. Introduction to Pharmacological Principles
3. Systems Pharmacology
4. Molecular Pharmacology of Cancer
5. Neuropharmacology
6. Biostatistics
7. Pharmacology Research Seminar

Each student also completes at least one elective by June of the second year. This elective is selected from courses that are offered by other programs at the Graduate School.

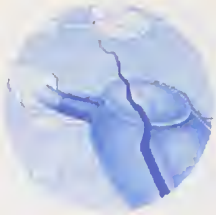
Program Supervision and Laboratory Rotations: The Program Director and the Curriculum Committee will supervise the student's graduate program until the student selects a faculty member to serve as the major sponsor. Three laboratory rotations are required of each student. These rotations provide the opportunity for the student to participate in the diverse research activities that are available within the Program. This experience is designed to assist the student in the selection of major and minor sponsors for the thesis research.

Admission to Doctoral Candidacy: The Admission to Candidacy Examination consists of two parts: a uniform written exam and an oral exam which includes discussion of a written research proposal. It is expected that most students will take this exam by the end of May of their second year.

Special Committee: The Special Committee is comprised of a major faculty sponsor and two minor faculty sponsors. The Program Director will assist the student in the selection of the major (thesis) advisor.

Retreat: The Pharmacology Program holds a retreat each year in the spring, usually for two days at a country inn. Members of the Program gather for a series of informal talks and a poster session to exchange the latest scientific information. This provides a relaxed setting for new incoming graduate students to meet other graduate students, postdoctoral fellows, and faculty members in the department.

Other Sources of Information: See the Medical College WWW Home Page at http://www.med.cornell.edu. See also the Instant Inquiry at Petersons Education Center at http://www.petersons.com/sites/gunits/045732u.html



Physiology, Biophysics and Molecular Medicine

Faculty

Olaf S. Andersen
Thomas J.J. Blanck
Daniel Catanzaro
Ronald G. Crystal
Jay M. Edelberg
Daniel Gardner
Bernice Grafstein
Doris A. Herzlinger
Katherine A. Hajjar
Barbara L. Hempstead
Xin-Yin Huang
Jason A. Koutcher
Gloria C. Li
Thomas M. Maack
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Randi B. Silver
Roy L. Silverstein
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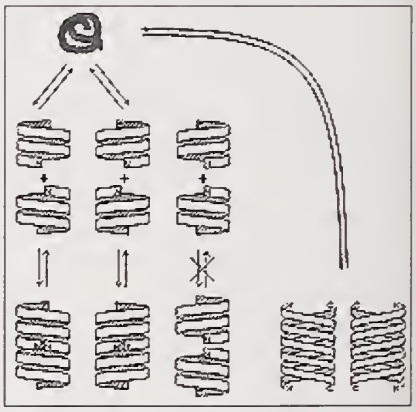
Overview of Research Activities

Physiology is the science of biological function, of how living things work. Research in physiology, biophysics and molecular medicine combines studies of function at the molecular and cellular levels with integration of this knowledge into analysis of organ systems and whole animals. A strong emphasis is placed on a quantitative understanding of each level of organization. These insights will eventually be applied to clinical medicine to aid in prevention, diagnosis and treatment of human disease. The members of the Graduate Program in Physiology, Biophysics and Molecular Medicine study function at the molecular, cellular, and organ system levels using a wide variety of scientific disciplines that, in addition to physiology, include biochemistry, cell biology, computer modeling, molecular and cellular electrophysiology, molecular biology, neuroanatomy, neurophysiology and nuclear magnetic resonance. The research interests of the faculty are concentrated in five areas of biomedical science: 1) the structure, function and regulation of integral membrane proteins, including ion channels and hormone receptors; 2) intracellular electrolyte homeostasis, cell volume regulation, and renal function; 3) mechanisms of hormone action, receptor turnover, and gene regulation; 4) development and regeneration in the kidney and the nervous system; and 5) radiation biology.



Folding pathways for the formation of membrane-spanning channels by sequence-substituted gramicidin analogues. A given peptide may form up to three different conducting channels, whose structures can be identified by single-channel electrophysiology. (Andersen Laboratory)

Dr. Andersen investigates the molecular mechanisms governing the function of membrane-spanning ion permeable channels. These questions are addressed using a combination of electrophysiological studies of channel function and spectroscopic studies of channel structure, in conjunction with theoretical/computational analysis of channel folding, ion permeation and channel-bilayer interactions.

Dr. Blanck's research interests include the characterization of the effects of anesthetics on intracellular calcium distribution in cardiac and neuronal cells. These studies will further the understanding of how volatile anesthetics work to produce general anesthesia, their protective effects during ischemia, and their depressive effects on cardiac contractility.

Dr. Catanzaro investigates control of blood pressure by the renin angiotensin system. These studies focus on the molecular mechanisms that normally direct and regulate renin synthesis and secretion and disruptions that cause hypertension.

Dr. Crystal's major research interest focuses on understanding, preventing and treating hereditary and acquired human disorders by defining and modulating the genetic repertoire of somatic cells. To this end, his laboratory uses *ex vivo* and *in vivo* gene therapy strategies directed toward modulating gene expression relevant to pulmonary, cardiovascular, infectious, hematologic and neoplastic disorders. The interests of the laboratory include design of gene transfer vectors, defining the interaction of gene transfer vectors with target cells, the mechanisms used by viruses to transfer their genome to the nucleus, and the development of chimeric promoters to control transgene expression.

Dr. Gardner's research has two goals: understanding how neuronal identity is related to biophysical properties and network connectivity, and how neuronal signals code information. A component of the NIMH's Human Brain Project, his lab is designing networked databases of neuronal descriptions and characteristic neurophysiological data, analogous to genome and sequence databases.

Dr. Grafstein's primary interest is in nervous system regeneration and development. Her current research seeks to define the role of the pia-arachnoid in regulating the extracellular environment of the brain, which may have a defining influence on neuronal growth and function. In particular, she is interested in calcium signaling between the pia-arachnoid and the neuronal-glial compartment of the cerebral cortex.

Dr. K. Hajjar's laboratory studies the role of proteases and biologic control. We have focused on the receptor-mediated assembly of proteins that generate the serine protease plasmin whose major function is to dissolve fibrin and other matrix components. Our model system includes the cell surface receptor annexin II which binds the plasmin precursor, plasminogen, as well as its activator, tissue plaminogen activator. This assembly dramatically augments the efficiency of plasmin generation. Annexin II is expressed on the surface of a variety of cell types including vascular endothelial cells, macrophages, glial cells, myeloid cells, and some tumor cells. Our current efforts focus on the role of annexin II in endothelial cell thromoresistance, angiogenesis, neuronal differentiation, and tumor cell invasion. We are examining regulation of annexin II expression during cellular differentiation, and developing a genetic animal model of annexin II deficiency.

Dr. Herzlinger's research program is focused on identifying the signals that enable embryonic cells to differentiate into the 14 different renal cell types required for normal kidney function. Utilizing the tools of molecular and cell biology, her laboratory has characterized embryonic renal stem cells, determined the stage at which these cells assume unique differentiated fates and identified a gene family that initiates their differentiation. Future directions in the lab include further characterization of the molecules required for kidney development and patterning during embryonic development.

Dr. Huang's research focuses on the signal transduction by heterotrimeric G proteins. The current focus is on direct stimulation of tyrosine kinases by G proteins, regulation of Ras-family of small G proteins, genetic and biochemical dissection of the vertebrate G-protein-MAPK pathway, and regulation and function of ion channels.

Dr. Koutcher's research focuses on in vivo applications of nuclear magnetic resonance (NMR) to the study of hematologic and neoplastic diseases. The focus of much of the work is to determine whether tumor metabolism, as monitored by *in vivo* NMR spectroscopy, can be used to 1) determine tumor sensitivity to anti-neoplastic therapy, or 2) to enhance treatment by optimizing the choice or timing of therapy based on changes in tumor metabolism.

Dr. Li's experiments have shown that of the many heat shock proteins (hsp's) preferentially synthesized after a heat shock, the concentration of hsp70 appears to correlate best with heat resistance, either permanent or transient. The long-term goal of this research is to establish the molecular basis related to the role that hsp70 plays in modulating cellular responses to heat and drugs or other environmental stresses.

Dr. Maack's studies are directed to the elucidation of the physiology of atrial natriuretic factor (ANF), a hormone which plays an essential role in pressure-volume homeostasis, and its receptors. Recent work has focused on the structure-function relationships of two different types of receptors: CG receptors are involved generation of the second messenger cGMP, while C-receptors participate in the removal of ANF from the circulation, and in this manner contribute importantly to the regulation of plasma levels of this hormone.

Dr. Palmer's research focuses on the mechanism of transepithelial Na^+ and K^+ transport by tight epithelia, and the control of this process by hormones. The major effort is to define the nature of the Na^{+-} and K^{+-} selective channels responsible for the movement of these ions across the luminal cell membrane of epithelia, and to identify the intracellular events that modify the function of the channels.

Dr. Silver is interested in the role of intracellular Ca^{2+} and H^+ in cellular homeostasis. The primary focus of the laboratory is in the application of fluorescence biotechnology to study intracellular pH regulation, as well as the variation in cytosolic Ca^{2+} levels in renal cells as they relate to perturbations in acid-base state or electrolyte balance.

Dr. Silverstein - The theme of this laboratory is the molecular pathogenesis of thrombosis, atherosclerosis, and inflammation,

with an emphasis on the role of cellular phagocytic and adhesion receptors. The current focus is on a multifunctional cell surface protein, CD36, which we and others have shown serves as a receptor for the anti-angiogenic protein TSP-1, and as a recognition/internalization receptor for fatty acids, apoptotic cells, and modified lipoproteins. It thus serves to regulate cholesterol and lipid entry into cells during atherogenesis and also functions to regulate angiogenesis. Current studies center on molecular mechanisms of CD36 signaling and on analysis of a CD36 "knock-out" mouse made in the lab.

Dr.Wang's prime interests are the science and engineering of magnetic resonance (MR) imaging, and its applications in clinical practice. Currently he is developing techniques for imaging blood flow in large vessels (angiography) and in microvasculature (perfusion). These techniques are targeted for applications in cardiovascular diseases and neuro-functional mapping.

Dr. Weinstein is interested in the theory of solute and water transport across epithelia, and the development of mathematical models that permit the computer simulation of normal and pathological conditions. The primary focus of this work is sodium reabsorption: the pathways and driving forces and the mechanisms by which cells maintain volume and solute composition despite fluctuations in solute transport.

Complete research descriptions can be found on the Graduate School Website at www.med.cornell.edu/gradschool.

Program Requirements

Admissions

Interested individuals are encouraged to contact the Program Director before preparing a formal application. Letters of inquiry should include a summary of the educational background and indicate possible areas of emphasis in the graduate study. Applicants must have completed courses in biology, inorganic and organic chemistry, physics, and mathematics through the level of differential and integral calculus. Additional course work in these disciplines at the undergraduate level is encouraged. The Graduate Record Examination is required and advanced subject tests are recommended. Applicants who lack certain course requirements but with otherwise exemplary records will be considered for acceptance provided that they remedy their deficiencies while in training.

Course of Study

The Program emphasizes the importance of research and teaching in the preparation and development of individuals for careers in physiology, biophysics and molecular medicine. This goal is achieved by a combination of didactic courses, seminars, and supervised research leading toward the preparation of a thesis.

A special program of study will be developed for each student in consultation with his or her Special Committee. For MD/PhD students, the program takes into consideration their coursework during the first two medical school years. Students that enter with an MD or a Masters degree will likewise have specially adapted programs.

In the first two years students are expected to satisfactorily complete a core curriculum. The curriculum will be determined by the student's previous coursework and likely research concentration. The curriculum usually will include:

First Year

1. Cell Structure and Function
2. Physiology of Organ Systems
3. Molecular Basis of Disease
4. PBMM Journal Club

Second Year

5. Selected advanced courses in membrane biophysics, imaging, modeling and synaptic physiology
6. Elective courses in biochemistry, cell biology, molecular biology and neuroscience
7. PBMM Journal Club

In addition, all students must complete three laboratory rotations; one of these is usually in the Thesis Advisor's laboratory.

The Thesis Advisor is usually chosen early in the second year. A Special committee consisting of the thesis advisor and two other faculty members will be constituted to guide the student in his/her research preparation. Students start their thesis research before completing their formal course-work, but they are not admitted to Ph.D. candidacy until they passing their Qualifying Examination toward the end of the second year. In later years, students will participate in small group teaching activities in graduate school and medical school courses.

For more information see the WWW Home page: http://physiology.med.cornell.edu

Master of Science in Clinical Epidemiology & Health Services Research

Faculty

Ronald D. Adelman	Robert M. Braude	Oliver T. Fein	Mark S. Lachs	Margaret G. E. Peterson
George S. Alexopoulos	Lawrence D. Brown	Joseph J. Fins	Carol A. Mancuso	Karl Pillemer
John P. Allegrante	Martha L. Bruce	James P. Hollenberg	Charles E. McCulloch	Laura Robbins
Mitchell J. Blutt	Mark A. Callahan	Donald S. Kenkel	Barnett S. Meyers	Hirsch S. Ruchlin
Gilbert J. Botvin	Mary E. Charlson	John M. Kuder	Stephen A. Paget	Carol Storey-Johnson

Graduate Program Chairperson

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Graduate Program Director

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Overview

The program of study leading to the Master of Science (MS) degree in Clinical Epidemiology & Health Services Research is designed for those who wish to plan, implement and analyze quantitative and qualitative research studies, using appropriate research designs. The core of the curriculum includes research methodology, biostatistical techniques, data management, decision analysis, health economics and program evaluation. Graduates of the program will be prepared to pursue academic careers in a variety of settings where data is required to answer complex questions. The emphasis is on training clinician researchers to teach research methods, conduct methodologically rigorous and scientifically sound studies, evaluate programs and perform cost-effectiveness and cost-benefit studies in a variety of populations.

Admission. Admission to the program requires an MD degree or an RN certificate with three years of work experience and acceptance into theWeill Graduate School of Medical Sciences of Cornell University. In most instances, physicians will have completed residency programs and nurses will have had several years of work experience prior to enrollment.

Application materials must be completed and returned to the Office of the Weill Graduate School of Medical Sciences together with (1) official transcripts of records from all colleges and universities attended, (2) a statement of purpose of graduate study, and (3) two letters of recommendation from individuals in academic positions who know the applicant professionally. In addition, scores from the Graduate Record Examination (GRE) or Graduate Medical Aptitude Test (GMAT) are beneficial but not required to aid in the evaluation of the applicant.

The completed application and all supporting documents will be initially screened by the Clinical Epidemiology and Health Services Research program faculty. Personal interview meetings will be scheduled and held with each potential applicant. Applications for July admission and all credentials, including official transcripts of records from all colleges and universities attended, must be received by the deadline of June 1. A nonrefundable fee of $50 is charged for filing an application for admission.

Course of Study. Eligibility for the Master of Science degree in Clinical Epidemiology and Health Services Research requires the satisfactory completion of no less than 30 credits of course work and the completion of an integrative project or a research thesis. After completion of the curriculum and culminating project, students will be required to defend their findings. The projects are at the core of the Clinical Epidemiology and Health Services Research program. The most important foundation for preparing individuals for future careers is the utilization of new skills and knowledge to conceive, design and conduct research projects, with faculty guidance and support.

For full-time students, the two-year program begins with an intensive summer session, with the remainder of the course work completed during the subsequent Fall and Spring semesters. The second year is devoted to the development, administration and analysis of the research or culminating project. The program can also be completed on a part-time basis – up to four years – to accommodate individuals with differing needs and limited time commitments. The format for each of the curriculum units is small-group seminars, with interactive lectures. Each of the sessions has required homework assignments; the candidate must successfully complete each assignment to pass the course.

Tuition and Fees. Tuition for the Masters Degree Program in Clinical Epidemiology and Health Services is projected to be $21,000 for the entire program. Tuition includes fees for matriculation and graduation expenses.

Refunds. Part of the tuition will be refunded if the student obtains official certification of leave of absence or withdrawal from the Graduate School of Medical Sciences during the semester. Students who terminate their registration during a regular term in this manner will be charged tuition from the registration day to the effective date of the certificate as follows: first week, 10 percent; second week, 20 percent; third week, 30 percent; fourth week, 40 percent; fifth week, 60 percent; sixth week 80 percent; seventh week, 100 percent. No charge will be made if the effective date of leave or withdrawal is within the first six days of the term.

Fellowship Training Opportunity. Health Services Research Training Fellowships are available for physicians who have completed an accredited residency training program in any clinical area. The program is open to citizens and permanent residents of the United States. The program seeks physicians who are committed to the application of health services research and clinical epidemiology to the improvement of health care and who are committed to pursuing a research career. This fellowship is administered through the Division of General Internal Medicine, at Weill Medical College of Cornell University.

Complete research descriptions can be found on the Graduate School Website at www.med.cornell.edu/gradschool.

Program Requirements

The two-year program of study for the MS degree in Clinical Epidemiology & Health Services Research includes required and elective courses and begins with an intensive summer session in year one. To facilitate the development and completion of the research thesis, students are encouraged to attend at least two of the weekly research seminar/conferences during the second year. Students must complete all of the required introductory and advanced seminars, including weekly research methodology, health policy and multidisciplinary health services research seminar/conferences. Students are also expected to complete five of the eleven elective courses, the selection of which is guided by each student's area of interest.

After completion of the curriculum, students will be required to complete a research thesis and defend their findings. The thesis research projects are at the core of this Master's program. The most important foundation for preparing candidates for future careers is their utilization of their new skills and knowledge to conceive, design and conduct their own research projects with faculty guidance and support.

Course Offerings

Biochemistry & Structural Biology

Cell Biology & Genetics

Immunology

Molecular Biology

Neuroscience

Pharmacology

Physiology, Biophysics & Molecular Medicine

Clinical Epidemiology & Health Services Research

Course Offerings

Biochemistry & Structural Biology

Biochemistry and Structural Biology. A formal advanced biochemistry course offered jointly by Molecular Biology, Cell Biology & Genetics and the Biochemistry & Structural Biology Programs. Biochemistry and Structural Biology is a two quarter course which is part of the core requirements of the Program. The course covers equilibria, bond formation, protein chemistry and structure, nucleic acid chemistry and structure, ligand binding, chemical and enzyme kinetics, enzyme reaction mechanism, principles of macromolecular analysis, principles of protein purification, and principles of macromolecular recognition and specificity. Quarters I and II annually. Drs. Kenneth Marians, Tim McGraw, Nikola Pavletich, Stewart Shuman and staff.

Structural Analysis. This course will cover the structure, folding and interactions of proteins with the emphasis on relating structure to biological function. Biophysical techniques will be introduced and their applications outlined. Dr. Nikola Pavletich and staff. Offered in alternate years.

Protein-Nucleic Acid Interactions. This course will cover known structures of protein-DNA and protein-RNA complexes and their role in replication, transcription, translation and recombination of the genetic code. Dr. Patel and staff. Offered in alternate years.

RNA World. This course consists of lectures, discussions and assigned reading. RNA evolution from a primitive, all-RNA system to the present one and RNA:RNA interactions, both structural and enzymatic, are considered, leading to detailed discussions of RNA enzymes (ribozymes) and their substrates. The course emphasizes RNA:protein interactions and the functional motifs involved. RNA domains considered include ribosome binding sites; double-stranded RNA interaction regions; targets for other specific RNA-binding proteins; and the interactions involved in RNA splicing. Dr. Robertson. Offered in alternate years.

Membrane Biology. This course covers the fundamental concepts involved in the chemistry and physical properties of lipids and carbohydrates. Metabolic aspects of carbohydrates and lipids will be discussed. Structure-function relationships during membrane biogenesis will be covered including the molecular aspects of membrane fluidity, membrane dynamics, and protein-lipid and protein-protein interactions. Drs. Maxfield, McGraw and Ryan. Offered in alternate years.

Introduction to Research. Laboratory rotations in experimental biochemistry dealing with the isolation, synthesis, and analysis of substances of biochemical importance (enzymes, proteins, nucleic acids, lipids, and metabolic intermediates), and study of their properties by various chemical and physical techniques. The student obtains this varied research experience by spending approximately two months in the laboratory of each of three faculty members of his or her choice. For incoming graduate students majoring in Biochemistry & Structural Biology.

Biochemistry & Structural Biology Journal Club. This course meets weekly during the academic year and is required for all graduate students. Students and postdoctoral fellows meet, with faculty supervision, to discuss recent papers of biochemical importance. Student participation involves the presentation of papers and critical discussion of their contents and significance. Offered yearly and meets throughout the academic year. Dr. McGraw.

Biochemistry Seminars. A seminar series in which students, faculty, and invited scientists from this and other institutions report on progress in their laboratories.

Course Offerings

Cell Biology & Genetics and Molecular Biology Programs

Biochemistry and Structural Biology. A formal advanced biochemistry course is offered jointly by the Molecular Biology and the Biochemistry and Structural Biology Programs. Biochemistry and Structural Biology is a two quarter course which is part of the core requirements of the program. The course covers equilibria, bond formation, protein chemistry and structure, nucleic acid chemistry and structure, ligand binding, chemical and enzyme kinetics, enzyme reaction mechanism, principles of macromolecular analysis, principles of protein purification, and principles of macromolecular recognition and specificity. Quarters I and II annually, Drs. Kenneth Marians, Tim McGraw, Nikola Pavletich, Stewart Shuman and staff.

Molecular Genetics. The course is organized around the principles of genetic analysis, with examples chosen from organisms that best illustrate those principles. The course is based on lectures and problem sections. The topics to be covered include: the nature of the gene; linkage and physical maps; chromosome structure and segregation; recombination mechanisms; nature of mutations; mutations as tools to dissect gene function; transposition; genetic analysis of the regulation of gene expression. Quarters I and II annually, Dr. Kathryn Anderson and staff.

Cell Biology. This course explores key aspects of cell biology at a detailed molecular level. The focus is on the integration of structure/function relationships for proteins in cell membranes, cytosol, and nucleus. Specific topics include: membrane structure; protein biosynthesis and vesicular trafficking; cell architecture and motility; receptor and oncogene mediated signaling; intercellular interactions; cell-cell adhesion; and the cell cycle. The course consists of two lectures per week plus one interactive discussion section involving current research papers. Quarters III and IV annually, Drs. Marilyn Resh, Joan Massague, Tim McGraw and staff.

Gene Structure and Function. A two-quarter course that explores the regulatory mechanisms governing the flow of information in cells from DNA to RNA to protein. The first module of the course deals with DNA replication, recombination and repair, and introduce basic principles of DNA topology and protein-DNA interactions as they apply to these and other processes. In the next module, the fundamentals of gene structure and transcription are presented. Topics to be discussed include: structure and function of transcription factors and RNA polymerases; mechanisms of transcriptional activation and repression; transcriptional control of the cell cycle; and the effects of chromatin structure on transcription. The final module covers post-transcriptional processing of RNA, including its translation into protein. Topics include: RNA splicing and editing, polyadenylation; mRNA transport and finally, regulation of translation. Quarters III and IV annually, Drs. Robert Fisher, Leonard Freedman and staff.

Logic and Critical Analysis. This course is designed to teach the critical analysis necessary to be a successful scientist. Student reads papers in the primary literature and discuss the experiments. Questions addressed are: what was the hypothesis, what were the experiments designed to test, what other information is necessary to interpret the experiment, do the experiments accomplish this goal, what problems exist in the experiment, and where might you go from here? To develop the critical analysis skills required, the first group of presentations will emphasize one or two figures in each paper. Following development of critical skills required to read the primary literature, two to three papers will be assigned as a thematic group by each instructor to be discussed sequentially. Quarters III and IV annually, Dr. Koff and staff.

Graduate Research Seminar. This course represents an opportunity for the faculty and students of the Molecular Biology and Cell Biology & Genetics Programs to hear the upper-class students describe their research in formal seminar presentations. Quarters I - IV annually, Dr. Benezra.

Nucleic Acids Enzymology. A formal course presenting the enzymological mechanisms and control of prokaryotic and eukaryotic transcription and DNA replication. Enzymes which alter DNA structure and shape are reviewed and topics in DNA repair and recombination are also covered. Quarters I and II alternate years. Drs. Marians, Hurwitz, and staff.

Molecular Virology. A formal course in which major emphasis is placed on the basic mechanisms in the biology of all animal viruses, including RNA and DNA tumor viruses. The topics considered include: virus structure and composition; assay of

viruses and viral-specific products; transcription and replication of viral nucleic acids; translation of virus-specific proteins; assembly of viral particles; structural and functional alterations in viral-infected cells, including transformation, pathogenesis of viral diseases, and viral genetics. Quarters III and IV, alternate years. Drs. Falck-Pedersen, Stewart Shuman and staff.

Molecular Biology of Cancer. This course presents an in-depth analysis of the mechanistic basis of cancer: the nature of the neoplastic cell phenotype, the genetic alterations found in cancer cells, and the functional mechanisms by which these alterations contribute to tumorigenesis. After an introduction to hereditary, viral, and environmental risk factors in cancer, the key role of deregulated cell cycle checkpoints is discussed, together with the mechanisms by which oncogenes and tumor oppressor genes affect growth regulation, apoptosis and DNA repair . Examples of specific types of malignancy are used to illustrate human cancer genetics, tumor progression, and the role of DNA rearrangements and genomic instability. Other topics include mechanisms of invasion, metastasis, and tumor angiogenesis. The final module of the course considers how our understanding of the molecular basis of cancer can lead to novel methods of cancer therapy and prevention. The course format is a combination of lectures and discussion groups. Quarter III, annually, Dr. Brown and staff.

Developmental Biology. Key concepts in developmental biology are presented and discussed drawing on research from a number of model systems, including *Drosophila*, *C. elegans*, *Xenopus*, zebrafish, chicken and mouse. The course stresses genetic, cellular, molecular and comparative approaches to problems in development. During the first half, the course concentrates on early embryogenesis and pattern formation in the different model organisms, specifically axis determination, gastrulation and neurulation. This section of the course includes two practical lab sessions, which will provide first hand experience with manipulating and analysing embryos of different species. The second half of the course focuses on later developmental processes, including growth and patterning of the limbs, development of the nervous system and of sensory structures such as the eye, and the development of muscle, heart and lung. The course meets twice weekly and consists of lectures and interactive group discussions of classic and current research papers. Quarters I and II , annually. Drs. Niswander and Ulrike Gaul and staff.

Special Topics in Advanced Genetics. Specialized topics in advanced genetic analysis will be covered. Each four week module will include both lectures and discussion of recent papers from the literature on a focused topic. Topics will change from year to year. Examples of topics to be covered include: gene silencing in yeast and *Drosophila*; imprinting and X inactivation; sex determination; DNA repair and cancer genetics; genetic analysis of *Drosophila* wing development; genetic analysis of mammalian development. Quarters III and IV annually, Dr. Niswander and staff.

Human Genetics. The aim of this course is to review the major topics in contemporary human genetics. The course will prepare students for advanced study in human genetics. Topics to be covered are the following: linkage analysis and gene identification, cytogenetics, human genome project, molecular basis of human genetic disorders, immunogenetics, population genetics, human sex chromosomes, genomic instability syndromes, genetics of human cancer, complex diseases, mouse models for human disease, gene therapy. Lectures twice weekly. Quarter I, annually, Dr. Nathan Ellis and staff.

Course Offerings

Immunology

Fundamental Immunology. Quarters I and II of the course provide a comprehensive overview of basic immunology beginning with the specific interactions of target cells and T cells that are regulated by the MHC molecule and peptide antigens on the target cell and the antigen specific T cell receptor. The development of antigen specific T cells in the thymus and their activation in the periphery, plus the development and activation of B cells are covered in detail. Specific roles for cytokines or lymphokines in the immune response are also important topics. Quarters III and IV of the course cover the contribution of innate and antigen non-specific mechanisms of host defense and topics of clinical relevance, such as microbial immunity, allergy, autoimmunity, tumor immunology, congenital and acquired immunodeficiencies, transplantation immunology and aging. The course is directed by Dr. Paolo Casali. Quarters I - IV, annually.

Advanced Topics in Immunology. This course, in modular format, is designed to teach selected topics, in depth, including historical overviews, underlying principles, current status, and significance for contemporary Immunology. Moreover, attempts will be made to connect immunological specialization with general principles of Biology and Biochemistry. The course will be open to all students and postdoctoral fellows. First and second year students will be required to take three modules for credit. Planned topics will include B cell development, T cell development, signal transduction, apoptosis, tumor immunology, developmental immunology. Other modules will be added ad hoc. This course is directed by Dr. Ulrich Hammerling. Quarters I - IV, annually.

Immunology Graduate Research in Progress. This course is designed to provide all Immunology Program graduate students with experience in preparing their experimental data for oral presentations. Each student is required to give several talks based on their research. The course is directed by Dr. Derek Sant'Angelo. Quarters I - IV, annually.

Seminars in Immunology. This course is designed to offer all graduate students in the program an exposure to cutting edge research by national and international leaders in all fields of immunology, including natural immunity, B and T cell biology, immunity to infectious agents and tumors. The course is directed by Dr. Peggy Crow and Dr. Lisa Denzin. Quarters. I - IV, annually.

Course Offerings

Neuroscience

Genes, Drugs, and the Brain (GD&B). This is a year-long, integrated series of independent courses that will provide interested students with a working knowledge of fundamental neuroscience. Each course is self-contained, and each may be taken individually. Each course is described individually below. The series includes: Channels, Pumps and Receptors (Quarter 1); Molecular and Cellular Neuroscience (Quarter 2); Structure of the Nervous System/Biogenic Amines, Addiction, and Integrated Behavior/Excitation and Inhibition in the CNS (Quarter 3); Neuropeptides (Quarter 4a); Cholinergic System, Motor Control, Learning, and Behavior (Quarter 4b).

Channels Pumps and Receptors (GD&B 1). See description under Physiology and Biophysics. Quarter I, Dr. Larry Palmer.

Molecular and Cellular Neuroscience (GD&B 2). The course will emphasize the molecular, cellular, and biochemical research opportunities in the nervous system. Topics covered include: regulation of gene expression in neurons and glial cells, control of neurotransmitter synthesis, the biology of the synapse, signal transduction by cell surface receptors, polarization of neurons, axonal transport, membrane potential and neurophysiology. It is generally taken in the first year by neuroscience students, but it is also appropriate for second year students from other programs who want an introduction to neuroscience. Quarter II, Dr. Sung.

Structure of the Nervous System/Biogenic Amines, Addiction and Integrated Cell Behavior/Excitation and Inhibition in the CNS (GD&B 3). This course combines consideration of the structure of the nervous system and the neuropharmacology of neurotransmitters in the context of the function of the nervous system. It provides an introduction to neuroanatomy and a more detailed consideration of receptors for the biogenic amines, GABA, and glutamate. Quarter III, Drs. Toth, Baker, and Grafstein.

Neuropeptides (GD&B 4a). This mini-course considers the unique features of neuropeptides as neurotransmitters and neuromodulators in the CNS as well as their role in neuroendocrine regulation. It will focus on opiates and pituitary peptides as specific examples of this large class of signaling molecules. Quarter IV, Drs. Inturrisi and Szeto.

Learning, Memory, Motor Control and Behavior (GD&B 4b). This course will describe cholinergic and NOergic neurons and attempt to show how the nervous system integrates sensory input and produces behavior. Completion of some of the earlier parts of this series or extensive independent study will be necessary to appreciate this material. Quarter IV, Dr. Gibson.

Research Proposals and Scientific Journalism: Inspiration, Writing, and Evaluation. This seminar course will provide students with experience in developing and writing both a popular science article and a research plan in an area of their own choosing. Students will also critically evaluate the merits of specific approaches to scientific problems. It will meet about eight times during the third and fourth quarters, but requires submission revised assignments between classes. Quarters III and IV, Drs. Wagner and Weil.

Research Rotations in Neuroscience. Neuroscience students who have arranged for a research rotation must register for this course each quarter the rotation is conducted. The student must submit a one page description of the proposed research in the first two weeks of the rotation and submit a 3-5 page description of the research that has been completed as soon as the rotation is finished. The faculty member will provide a 1-2 page commentary on the accomplishments of the student during the rotation. Students meet at the beginning of each quarter to describe their current rotation project.

Developmental Neurobiology. This course explores fundamental concepts in the development and maintenance of the nervous system. Major topics include classical neuroembryology, inductive effects, cell lineage, determination of cell fate, axonal guidance, synaptogenesis and specificity of synapse formation, cell-cell interaction, and naturally occurring cell death. It is coordinated with the course in Developmental Biology offered by the Program in Cell Biology and Genetics. Quarter III, bi-annually. Dr. Goldman and faculty of the Program in Neuroscience.

Pathobiology of Neurological Disease. This course will review the basic pathophysiology of important neurological diseases. The course will focus on complex disease processes that are best approached from a multidisciplinary point of view. Topics may include stroke, multiple sclerosis, epilepsy, Alzheimer's disease, Parkinson's disease and selected behavioral or psychiatric disorders. The course will consist of both lectures and informal discussions of recent research papers. It is designed to be taken in sequence with Molecular Basis of Neurological Disease and is open to medical students as an elective. Quarter II, annually. Dr. Plum and faculty of the Neuroscience Program.

Molecular Basis of Neurological Disease. This course will review current attempts to understand neurological disease from a molecular point of view. Students will learn how to apply the basic methods in molecular biology and molecular genetics to the study of neurological disease. Topics will include muscular dystrophy, myotonic dystrophy, myasthenia gravis, Alzheimer's disease, Huntington's disease and Charcot-Marie-Tooth disease. The course will consist of lectures, critical discussions of recent research papers and the preparation of an original research paper. This course is designed to be taken in sequence with Pathobiology of Neurological Disease. Quarter I, annually. Dr. Goldman.

The Visual System. The visual system offers marvelous opportunities to study fundamental problems in neuroscience. These seminar courses, which vary from year to year, offer lectures and readings on current research topics in the vertebrate visual system. In 2001-2002, the course will consider "Systems Neurophysiology" (Quarters II-III at Rockefeller University) and "Visual Processing" (Quarter IV). Dr. Jonathan Victor organizes every year a "Mini-rotation in Ophthalmology" with clinical faculty from the Department of Ophthalmology. Drs. Rodriguez-Boulan and Victor, with faculty of the Tri-Institutional Training Program in Vision Research.

Mathematical Methods in Neuroscience. This course provides a didactic introduction to a variety of mathematical approaches in neuroscience, selected both because of their proven usefulness and their intrinsic interest. Mathematical structures traditionally considered "advanced" will be introduced in an elementary fashion. Applications to be considered will include the analysis of channel activity, the analysis of spike trains, and image analysis. Quarter I, Dr. Victor.

Functional Neuroimaging. Current developments in imaging technology (magnetic resonance imaging, MRI, and positron-emission tomography, PET) open a new window of opportunity for neuroscientists to observe localized neural activity and to study neural organization in the human brain. The aim of this course is to introduce the fundamental principles of functional imaging (with a particular emphasis on MRI and PET) and to survey the literature and emerging new developments in neurobiology. Students will have an opportunity to observe and participate in on-going functional MRI investigations. Quarter IV of alternate years. Dr. Hirsch and faculty of the Neuroscience Program.

Proseminar in Synaptic Physiology. See Course Offerings for Program in Physiology and Biophysics for description. Fourth quarter.

Progress in Neuroscience. This course is the seminar series in the Program in Neuroscience. Most lectures are given by speakers invited from outside the Cornell community, but speakers are also drawn from the Program in Neuroscience and scientists at Cornell with related interests. Quarters I-IV, annually. Dr. Duvoisin and the seminar committee.

Progress in Neuroscience/Current Topics in Neurobiology. This course combines the seminar series in the Program in Neuroscience with critical discussions of papers published by the speaker, or related papers in the area of that week's seminar. Faculty of the Neuroscience Program.

Course Offerings

Pharmacology

Cell Structure and Function. The objective of this interdisciplinary course is to present our first year graduate students with basic principles of cell function as described by biochemistry, cell and molecular biology, molecular pharmacology and electrophysiology. It is intended to lay a foundation for more specialized courses and laboratory research. The course consists of lectures, journal clubs, experimental design sessions and small group discussions. It is taught by faculty from throughout the graduate school of medical sciences and is required for all incoming Pharmacology students. Quarters I - II, annually. Course organizer: Dr. Pardee.

Introduction to Pharmacological Principles. This course is designed to familiarize the student with concepts somewhat unique to pharmacology. This introductory graduate student course emphasizes general concepts in receptor theory, dose response relationship, mechanisms of drug action and resistance, pharmacokinetics, metabolism, tolerance, and dependence. All first year graduate student in Pharmacology are required to take this course. This course is integrated with the Cell Structure & Function in terms of subject matter. Quarters I - II, annually. Course organizer: Dr. Gross.

Systems Pharmacology. This course focuses on the physiology and pharmacology of the cardiovascular, respiratory, urinary, gastro-intestinal, and endocrine systems. Quarters III - IV, annually. Course organizer: Dr. Chan.

Molecular Pharmacology of Cancer. This course examines drug action at the molecular level, particularly with respect to cancer therapeutics, and consists of both lectures and reviews of current journal articles. Topics include mechanisms of drug resistance, oncogenes and tumor suppressor genes, computer based drug design, immunotherapy, hormone therapy, differentiation agents, tumor promotion and environmental toxins, tumor angiogenesis, and tumor metastasis. Quarter IV, annually. Course organizer: Dr. Bertino.

Neuropharmacology. This course consists of modules 3 and 4 of the Genes, Drugs and the Brain (GD&B) course. This course is jointly sponsored by the Neuroscience and Pharmacology Programs. It is designed to present current concepts of the major central nervous system (CNS) neurotransmitters and their functional neuroanatomy. The course will integrate discussions of the mechanisms of neurotransmitter biosynthesis and release, receptor signal transduction and the alterations produced by CNS drugs. Quarters III - IV, annually. Course organizers: Neuroscience faculty and Dr. Toth.

Biostatistics. The course is targeted at individuals involved in clinical and biomedical research. The course consists of lectures and discussions on exploratory data analysis, basic concepts of statistical analysis, construction of hypothesis tests and confidence intervals, the development of statistical methods of analyzing data and development of mathematical models used to relate a response variable to explanatory or descriptive variables. Quarter I, annually. Course organizer: Dr. Heller.

Pharmacology Research Seminar. Topics of contemporary pharmacological interest and new concepts and methodological approaches in biological research will be presented by guest speakers from universities, pharmaceutical companies and pharmacology faculty members. The presentations are followed by a discussion session which provides an opportunity for students to meet and talk to leading scientists in the field. Details of events will be announced in advance. Quarters III - IV, annually. Course organizer: Dr. Buck.

Research in Pharmacology. Research opportunities may be arranged throughout the year for graduate students who are not majoring in pharmacology but who want some investigative experience in the discipline. Special opportunities are offered for work on the nervous and cardiovascular systems and in biochemical and clinical aspects of pharmacology.

Pharmacology Journal Club. This is an informal course, designed to improve skills in critical reading and oral presentation of scientific information. It is organized and administered by the graduate students in the Pharmacology program and continues throughout the academic year.

Course Offerings

Physiology and Biophysics and Molecular Medicine

Cell Structure & Function. This is a multidisciplinary course which covers basic aspects of the cell from the perspective of cell biology, molecular biology, biochemistry, electrophysiology and molecular pharmacology. It is the first part of the core curriculum and is required for all first-year students. The course consists of lectures, small group conferences and journal clubs. Quarters I - II, annually. Course organizer: Dr. Pardee.

Physiology of Organ Systems. This course is the second part of the core curriculum. It builds on the foundation of the Cell Structure and Function applying basic concepts to the molecular and cellular physiology and pharmacology of the cardiovascular, respiratory, urinary, and gastrointestinal systems and endocrinology. The course consists of lectures, small group conferences and journal clubs. Quarters III and IV, annually. Course organizer: Dr. Palmer.

Molecular Basis of Disease. This course presents a detailed analysis of a small number of diseases from the molecular level through to the clinical illness including new approaches to therapy. Patients will be presented/interviewed. Normal physiology and pathological biology of the affected cells/tissues/organ systems will be reviewed. Emphasis will be placed on understanding the molecular details of the pathogenesis of each disease. Quarter IV. Course organizer: Dr. K. Hajjar.

PBMM Journal Club. This is a series of discussions of recently published papers in the fields of physiology, biophysics and molecular medicine. The papers are chosen and presented by the students under the guidance of a faculty member. Quarters I - IV, annually. Course organizer: Dr. Herzlinger.

PBMM Seminar Series. A required course that exposes program students to recent research developments. Outside seminar speakers are invited to discuss their latest research. Quarters I -IV, annually. Course organizer: Dr. Palmer

Physical Principles of Medical Imaging. This is a one-semester course covering the basic concepts of major modern diagnostic imaging technologies. Emphasis is placed on magnetic resonance imaging (MRI). Computerized tomography (CT) and ultrasound (US) are also covered. Students will gain fundamental technical knowledge of medical and an overview of current status of medical imaging technologies. Quarters I and II, annually. Course organizer: Dr. Wang.

Energetics and Kinetics of Biological Processes. The objective of this course is to provide a rigorous description of the physical chemical principles underlying some "simple" systems that recur in biology with an emphasis on membrane-related events. The topics will include: random events; electrodiffusion; chemical equilibrium; the two-state channel; ligand binding and receptor activation; complex gating mechanisms; channel-mediated ion movement and ion selectivity; conformational carriers and coupled transport systems. Quarters III and IV. Course organizers: Drs. Andersen and Palmer.

Mathematical Models of Membrane Transport. The general, thermodynamic description of membrane and epithelial transport will be reviewed. Comparison with kinetic descriptions of membrane transport will be considered, and the analysis of composite membrane systems will be examined as a prelude to the construction of epithelial simulations. Examples of such simulations will be used to examine transport along the kidney tubule under normal and pathological conditions. Quarters III and IV, annually. Course organizer: Dr. Weinstein.

Proseminar in Synaptic Physiology The biophysics of synapses and their relation to behavior are explored by reading and discussion of seminal papers in the original literature. The first half of the course examines a model synapse, the mammalian neuromuscular junction, by intracellular recording, voltage clamping, noise analysis, and patch clamping. Topics in the second half include NMDA receptors, plasticity, and neural networks. Minimum: five students. Quarter IV, annually. Course organizer: Dr. Gardner.

Course Offerings

Clinical Epidemiology & Health Services Research

REQUIRED COURSES

Introduction to Research Methodology and Statistical Analysis. The basic architecture of clinical and health services research will be presented. Emphasis will be placed on the three critical components: the population; the interventions, and the outcomes. Basic principles of measurement for categorical and continuous data, including the sources of variance and hypothesis-testing for such data, will be emphasized. Participants will also learn about Type I and Type II error. Faculty: Mary E. Charlson, M.D., Margaret Peterson, Ph.D. M.D. 3 credits.

Practical Applications and Computer Lab. An approach to computer technologies to facilitate the design, implementation, and data analysis of research projects will be covered. Methods of data collection, including data coding and error checking will also be addressed. The course is taught in a computer laboratory and is designed to outline a rational approach, with emphasis on both the pitfalls and potential of utilizing the computer. The course will also involve primary data collection in the areas of chart review, medical claims data, health survey questionnaire data, and clinical trial data. Faculty: Margaret Peterson, Ph.D., Carol Mancuso, M.D. 2 credits.

Introduction to Health Services Research. This course introduces students to critical issues in health organization, financing and policy which constitute the core of health services research topics. Students are prompted to consider the importance of the interrelationships between these issues and to apply critical thinking to the research. A variety of research methods and perspectives are presented to give students a flavor of the richness of this field. Specific topics include research areas of access and equity issues, evaluating health care quality and medical outcomes, health insurance and managed care effects on patient and physician behavior, and the evaluation of health care technologies and innovations. The course emphasizes the applied usefulness of research for policy making and organizational planning. Faculty: John Kuder, Ph.D. 2 credits

Clinical Economics. The techniques used by health economists and other health services researchers to evaluate the economic attributes of a program or intervention will be examined. Students will learn how to critique cost-identification, cost of illness, cost-benefit and cost-effectiveness studies, and use these techniques in their own research projects. Faculty: Hirsch Ruchlin, Ph.D. 1 credit

Behavioral Science and Health Education. This course will examine the applications of behavioral science and health education in a wide range of clinical medical problems and health promotion and disease prevention programs. Several theoretical models from the behavioral and social sciences will be reviewed. The course will also familiarize students with the concepts and basic steps used to develop and evaluate theory-based health education interventions. Faculty: John P. Allegrante, Ph.D. 2 credits

Qualitative Research Methods. Students will gain a basic fluency with qualitative research methods, a research tool for gathering and interpreting descriptive data from surveys, focus groups, and face-to-face interviews. The sessions will interweave the theoretical underpinnings of the methods with examples of qualitative research applications. The nexus between qualitative research and techniques of anthropological, sociological, and historical research will be explored. The use of qualitative methods in action or practice situations, and their application as a prelude to quantitative methods, is stressed. Faculty: Laura Robbins, DSW. 1-3 credits.

Decision Analysis. The basics of probabilistic thinking and the concept of heuristics will be reviewed. Students will learn the five-step process, specifically, the structuring of the problem, the application of probabilities, the application of values, the calculation of expected utilities, and the sensitivity analysis. Faculty: James Hollenberg, M.D. 2 credits

Advanced Biostatistics. The objective of this course is to convey basic concepts underlying multivariate analysis, with an emphasis on the handling of dimensional data. Considerations in dealing with survival analysis, odds ratios, and risk ratios are also covered in the course. 3 credits.

Advanced Seminar in Health Services Research. Attended by students and their primary faculty supervisors, students learn how to formulate and design their own research project, while critiquing and helping their colleagues. This provides the opportunity for students to learn from each others experiences. Students will use the structured opportunity of the colloquium to discuss their work and support each other in the development of their theses. Faculty: Mary Charlson, M.D. 1-6 credits.

Ethics of Clinical and Health Services Research. The objective of this course is to convey the critical issues in the ethical conduct of research. It will focus on key issues in clinical and health services research including conflict of interest, preserving confidentiality, and assuring data integrity. The course will review historical events which led to the enactment of legislation and the development of health policies governing the conduct of research. Office of Misconduct Case-studies will be reviewed, including the renowned Tuskegee Syphilis study. Students will learn how to handle research data. Participants will also learn how to develop study protocols which comply with Institutional Review Board standards. Faculty: Joseph Fins, M.D. 1 credit

Teaching How to Teach. Students will participate in a series of multi-component seminars using mini-lecture, videotape review and role play formats to acquire new skills. The topical content includes effective ways to handle the Learning Climate, Control of the Session, Communication of Goals, Promoting Understanding and Retention, Evaluation, Feedback, and Self-Directed Learning. The course imparts practical skills immediately useful to clinical teachers. Faculty: Carol Storey-Johnson, M.D. 2 credits

Multicultural Approaches to Community Health and Disease Prevention. This course is designed to provide an overview of cultural diversity, sensitize participants to their own cultural preferences, and explore how culture mediates health behaviors. The impact of culture on the development and implementation of health promotion policies, programs and health services research will be explored. Faculty: Laura Robbins, DSW. 2 credits

ELECTIVE COURSES

Health Economics. The objective of this course is to teach students to understand basic economic concepts and their relevance to the health care sector, and to learn to critically evaluate economic analyses reported in the health services research literature. It will also provide basic information in terms of how to design and carry out a health services research project incorporating an economic analysis. Faculty: Hirsch Ruchlin, Ph.D. 1 credit

Practical Issues in Health Services Research. Hands-on discussion of strategies to deal with the nitty-gritty problems that occur in the conduct of research, including strategies for locating, recruiting study patients, finding and following up on data, handling missing data, and other such issues that arise in clinical and health service research settings. Faculty: TBN. 1 credit

Critical Review of Current Clinical Epidemiology and Health Services Research. The objective of this course is to review, evaluate and synthesize new information appearing in the clinical epidemiology and health services research literature. Faculty. 1 credit

Health Policy and the Political System. Students will learn how to analyze the role of major institutions, such as the central government, the federal system, the private sector, and special interests groups, in formulating and implementing health policy in the United States. Discussions of underlying normative issues and cross-national perspectives will also be covered. Faculty: Lawrence Brown, Ph.D. 2 credits

Advanced Survey Design. This course reviews survey research methods for collecting, analyzing and evaluating health survey data. Topics include sampling theory, questionnaire design, interviewing techniques, and methods of survey administration. Faculty: John P. Allegrante, Ph.D. and Martha Bruce, Ph.D. 2 credits

New Business Development in Health Care. Students will learn how to conduct competitive analyses, estimate market share, develop management structures, and formulate financial forecasts and capital needs. This applied course offers students the opportunity to get hands-on training and expert guidance while developing their own business plans. Faculty: Mitchell Blutt, M.D., MBA. 3 credits.

Principles and Practices of Communicating Research Results. The objective of this course is to teach techniques for oral and written presentation of data. Students learn how to organize the results in order to optimally convey the significance of the findings. Topics include abstract writing, graphic presentation of data, use of slides and overheads, oral presentation skills, and manuscript preparation and submission. Faculty: Mary Charlson, M.D. 1 credit

SAS Data Management and Programming Tutorial. The SAS tutorial is designed to provide the basic skills necessary to import databases into SAS, and to analyze data. It covers the use of basic procedures for univariate analyses, using the assist menus, as well as creating simple programs with data transformation. Faculty: 2 credits.

Information Skills. The objective of this course is to provide a knowledge base, skills and techniques for performing literature searches on a variety of search engines including Medline, Ovid, Knowledge Server, and HealthStar. It also provides experience in tracking health-related information from the Internet using several search engines. It provides instruction in quality filters for searches to obtain the most relevant publications. A few sessions of the course are incorporated into the summer curriculum, as a prelude to the more formal course given in the autumn. Both courses focus on building and executing search strategies using Boolean logic and natural language. Participants acquire the skills to broaden or narrow searches and to critically evaluate and quality filter the results by using various search techniques. Faculty: Robert Braude, Ph.D. 2 credits.

Methods of Clinical Phenomenology and Course of Illness. This course provides an overview of the research methods used to study psychopathology and comorbid conditions using a longitudinal design. The selection of assessment instruments and statistical approaches appropriate for longitudinal observations are covered. Faculty: George Alexopolous, M.D. 1-2 credits

Program Evaluation. Students learn various techniques for evaluating programs and services, including the type of evaluation required in the context of the program and the population it serves. Students will also learn how to choose a comparison group and learn about options in measuring performance and results. Faculty: 2 credits.

Clinimetrics: Measurement in Health Research. The course teaches individuals how to evaluate the purpose of existing measurement scales and their relevance to specific research topics. Question development, item scaling, and overall scale performance are reviewed. Issues pertinent to reproducibility, validation and responsiveness are also explored. Faculty: Mary E. Charlson, M.D. 2 credits.

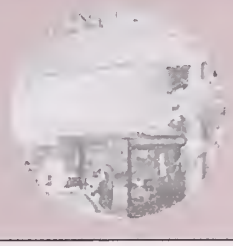
Multidisciplinary Conferences and Colloquia

The multidisciplinary conferences and seminars focus on important issues in health services research. They are designed to stimulate new interest and involvement in clinical research, create a supportive environment for new clinical and health services research projects, and demonstrate the value of multidisciplinary collaboration. The Health Policy seminars cover a broad range of topics relevant to health policy and involve both Weill Medical College of Cornell University faculty and many distinguished individuals from a broad range of fields in New York and from around the nation.

Research Methodology Core. The objective of this course is to review problems with design and conduct of studies. The course operates as "think tank" on issues, and includes a full meeting of a multidisciplinary group consisting of clinical epidemiologists, biostatisticians, health educators, health services researchers, health economists, data systems experts, psychologists and cooperating investigators.

Laboratory for Clinical Investigation. The objective of this course is to focus on important issues in health services research. Under the leadership of Dr. Carol Mancuso, the current course is designed to stimulate new interest and involvement in clinical research, create a supportive environment for new clinical and health services research projects, and demonstrate the value of multidisciplinary collaboration.

David Rogers Health Policy Colloquium. The objective of this course is to provide broad exposure to the cultural, social, political and economic issues shaping health policy. Weekly sessions are held with outside speakers from local, state and national government, as well as with private industry analysts, foundation executives and staff, health policy think tank analysts, academics and consumer and community interest groups.



General Information

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Summer Programs for Minority Students

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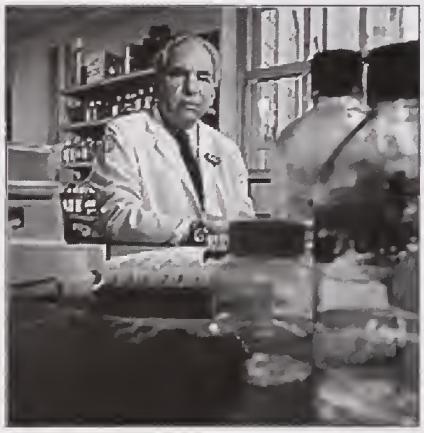
Admission

Applications

Applications to the Weill Graduate School of Medical Sciences of Cornell University are accepted for the degree of Doctor of Philosophy and, in the case of the Program in Clinical Epidemiology and Health Services Research, for the degree of Master of Science. An applicant must (1) have a baccalaureate degree or equivalent from a college or university of recognized standing, (2) have adequate preparation in the chosen field of study, and (3) show promise of ability to pursue advanced study and research, as judged by his or her previous record.

Students are admitted to one of the following programs: Biochemistry & Structural Biology, Cell Biology & Genetics, Immunology, Molecular Biology, Neuroscience, Pharmacology, Physiology, Biophysics and Molecular Medicine, and Clinical Epidemiology & Health Services Research. However, the initial affiliation with a program is far from rigid. For example, a student, after developing an awareness of the variety of research projects available for training, may remain in the original or may wish to change programs. Program transfers are most easily accommodated during the 1st year of graduate study in order that the student may complete required coursework of their new program before the Admission to Candidacy Examination held at the end of the 2nd academic year.

Inquiries about graduate study should be addressed to:



The Associate Dean of the Weill Graduate School of Medical Sciences
445 East 69th Street
New York, NY 10021
Telephone: (212) 746-6565
Fax (212) 746-8906
E-mail address: gsms@med.cornell.edu

Application materials must be completed and returned to:

Weill Graduate School of Medical Sciences
445 East 69th Street
New York, NY 10021

together with

(1) official transcripts of records from all colleges and universities attended
(2) a statement of purpose of graduate study
(3) two letters of recommendation from individuals in academic positions who know the applicant professionally.

In addition, scores from the Graduate Record Examinations (GRE) are required to aid in the evaluation of an applicant. Application for taking the Aptitude (Verbal, Quantitative, and Analytical) Test and the Advanced Test of the GRE, must be made directly to the Educational Testing Service, Graduate Record Examinations, P.O. Box 6000, Princeton, NJ 08541-6000. Students whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL). Application for this test must be made to: Test of English as a Foreign Language, P.O. Box 6151, Princeton, NJ 08541-6151. The proper Institution Code Number to use in the GRE or TOEFL application for the Weill Graduate School of Medical Sciences of Cornell University is R 2119.

All applications and credentials for September admissions, including official transcripts of records from all colleges and universities attended, must be postmarked by the deadline date of **December 15**. Because GRE scores are an important part of the application, it is of decided advantage to the applicant to submit these scores by the December 15th deadline. A nonrefundable application fee of $60 must accompany the application for admission. For applications postmarked by **November 15**, a reduced nonrefundable fee of $40 must accompany the application for admission. Applications may be submitted on-line through the Weill Graduate School website at www.med.cornell.edu/gradschool.

Admissions Process

The completed application and all supporting documents are initially screened by the credentials committee of the Program of Study to which the student is applying. Applicants considered potentially acceptable will be notified and invited to attend the graduate school recruitment days held in February for two days of program orientation, personal interviews, meeting with fellow candidates, current graduate students, and faculty and visiting the City of New York in a relaxed atmosphere. Candidates approved by each Program are forwarded to the Dean for final decision. A student is formally notified of acceptance for study in the Weill Graduate School of Medical Sciences of Cornell University by a letter from the Dean. An applicant accepted for admission is requested to inform the Graduate School promptly of her or his plan to either accept or reject the offer of admission.

It is the policy of Cornell University to actively support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age, or handicap. Admission policies are also in conformity with the policy of New York State with regard to the American ideal of equality of opportunity as embodied in the Education Practices Act.

Special Students

Special students are students who are not degree candidates in the Weill Graduate School of Medical Sciences of Cornell University and who are given permission by the Dean or Associate Dean to take courses and/or perform research for credit in the Graduate School. To obtain credits for work performed special students must be degree candidates at other institutions. Their activities at Cornell must be essential to their degree programs in studies not offered by the institutions in which they are matriculated as degree candidates, as certified by their institution. Enrollment as a special student is not intended as preparation for admission to degree programs at Cornell or elsewhere.

Special students receiving credit are accepted only with the approval of the appropriate Program Chairperson. Such students must demonstrate special qualifications in terms of preparation and ability. They must register with the Weill Graduate School of Medical Sciences of Cornell University and are required to pay all tuition and fees. Tuition is computed on the basis of the ratio of hours occupied by lectures and/or laboratory activities to the total hours of instruction for the academic year (33 weeks of 40 hours/week). There is a registration fee of $50.

Special student status may be given by the Dean or Associate Dean to take courses in the Weill Graduate School for individuals who are not degree candidates at other institutions. This category of special students must register with the Weill Graduate School but are not required to pay tuition or fees at the discretion of the Dean or Associate Dean. There is no registration fee. These students may take courses for non-credit only.

Campus Life

The Cornell University Medical College

Health Care

The Graduate School is dedicated to providing the finest medical care to students. Prior to matriculation, students must have a general health examination, which includes a physical examination, chest x-ray and basic laboratory tests, performed by their personal physical with the results forwarded to the Student Health Service. All full-time students enrolled in one of the Ph.D. degree-granting programs are covered by a comprehensive health plan. This includes access to Student Health Services, New York-Presbyterian Hospital clinics and physician referrals. Major-medical coverage for students and for eligible dependents is also available.

Residence Halls

Sloan House, located at 1233 York Avenue between 66th and 67th Streets, contains 33 studio and 29 one-bedroom apartments that are available only to graduate students. All apartments are air-conditioned , fully furnished, and have a outdoor balcony

terrace. Building amenities include laundry facilities, front door security, easy access to graduate faculty laboratories at Cornell and SKI, and a new lounge for social relaxation in a quiet upscale setting. Pets are allowed subject to housing restrictions.

The Rockefeller Research Laboratories of the Sloan-Kettering Institute

Jacob S. Lasdon House, an apartment residence located at 420 East 70th Street between York and 1st Avenues, contains studio, one-bedroom, and two-bedroom apartments for graduate students, medical students and postdoctoral fellows. Apartments are fully furnished, include kitchens, and are centrally air conditioned. Building amenities include laundry facilities, front door security, recreation room and an outdoor terrace. These apartments are available as roommate shares or family housing only. Pets are not permitted.

303 E. 71st Street is an apartment building located between 1st and 2nd Avenues for graduate students. One and two-bedroom furnished apartments are available for double occupancy or family housing. Pets are allowed subject to housing restrictions.

Livingston-Farrand Apartments, located on East 69th St. between York and 1st Avenues, contain furnished studio, one-bedroom, and two-bedroom apartments with kitchen facilities. These apartments are available by lottery selection for families and for upper-class medical and graduate students wishing single occupancy accommodations. Pets are not permitted.

Campus Security

Cornell University Medical College and the Graduate School of Medical Sciences annually distribute a campus security report to all students and employees which contains descriptions of policies and procedures for reporting crimes and emergencies and campus crime data. The report lists telephone numbers and contact information for security in campus facilities and residences. Policies and procedures for handling sex offenses and programs for victims are also described. Copies of the current annual security report are available to prospective graduate students upon request to the Graduate School Office.

Degree Requirements

The Special Committee

General degree requirements of the Graduate School of Medical Sciences are minimal in order to give maximum flexibility in choosing a desirable Program of Study. The student's program of study is determined with the aid and direction of a Special Committee, consisting of at least three faculty members chosen by the student who best fit his or her area of research interest. At least one member of the committee must represent a program different from the candidate's major program. Satisfactory progress toward a degree is judged solely by the committee. There are no regulations from the Graduate School of Medical Sciences governing the specific content of instruction, courses, or grades to which the Special Committee must subscribe, except those imposed by the Programs. The committee is primarily responsible for the candidate's development as an independent scholar and scientist.

The major sponsor (thesis advisor) usually advises the student concerning the selection of other committee members. Members may agree to serve until the candidate has had the opportunity to become acquainted with areas of research in the programs of his or her choice. On selection of a thesis project, a permanent Special Committee is formed, the membership of which can be changed during the thesis project with approval of the Program Chairperson or Director. Members of the Special Committee decide on the student's program of study and research. They judge whether progress toward a degree is satisfactory and prepare term reports on the candidate for submission to the Dean. The members of the committee serve on all of the candidate's examining committees and they approve his or her thesis. The formation of a permanent Special Committee requires the submission by the student of a Nomination of Special Committee form to the Graduate School Office. The Nomination of Special Committee form must be on file to schedule the Admission-to-Doctoral Candidacy Examination.

Registration and Course Grades

At the beginning of each term, students are required to register on-line with the Office of the Graduate School of Medical Sciences. A fee of $10 is charged for late registration. All courses for which the student registers for credit will be entered in the official transcript record. Grades of graduate students are reported as: Honors (A equivalent), High Pass (B equivalent), Low

Pass (C equivalent), Fail (F equivalent), Incomplete (I), Absent (Abs), Withdrawn (W) or Audit (Aud). A grade of Absent cannot be changed later than one term following the term in which the course was taken. Registration for the summer term is required of graduate students who will be engaged in research.

Residence

The Weill Graduate School of Medical Sciences of Cornell University regards study in residence as essential. Each candidate for an advanced general degree is expected to complete the residence requirements with reasonable continuity. A student must register each term from the time of initial registration in the Graduate School until the student either withdraws or completes a degree (unless a leave of absence has been granted). Full-time study for one-half academic year with satisfactory accomplishment constitutes one residence unit. Two units of residence are the minimal requirement for the masters degree and six units are the minimum for the doctoral degree. However, the time necessary to obtain the degree generally exceeds the minimal requirements. Currently, the average time to achieve the Ph.D. degree is 5-6 years. No more than seven years may intervene between the time of first registration and the completion of all requirements for the doctoral degree. Part-time graduate study is strongly discouraged. Requests for part-time study must be reviewed by the Executive Committee of the Graduate School. If permission is granted for part-time study, the student must be in residence at least half-time.

Transfer of Residence Credit

No residence credit will be granted for study outside the Graduate School of Medical Sciences to fulfill the requirements of the M.S. degree. No commitment can be made about granting residence credit toward the Ph.D. requirements for previous study in another graduate school until after the candidate has entered into residence at the Graduate School of Medical Sciences. At that time, the student's Special Committee may recommend acceptance of study outside the Graduate School of Medical Sciences to the Program Director and Associate Dean, who will jointly determine the number of residence units to be awarded. No credit can be transferred for study undertaken as an undergraduate or as a special student even in courses designed for graduate students.

A student who has satisfactorily completed two or more academic years of study toward the M.D. degree at Weill Medical College of Cornell University, or another accredited medical school in the United States with a curriculum equivalent to that of the Weill Medical College of Cornell University, may transfer a maximum of two units of residence credit after passing an evaluation examination administered by a committee appointed by the Graduate School of Medical Sciences.

Summer Research

Registration is required for the summer research term whether or not this effort is credited toward residence unit accumulation. Students registered for summer research may pay prorated tuition if they are obtaining residence credit. A degree candidate is eligible for no more than two residence units in any period of twelve consecutive months.

Study In Absentia

A candidate for the degree of Doctor of Philosophy may petition for permission to earn residence units for study away from Cornell University while regularly registered in the Graduate School of Medical Sciences. A candidate to whom this privilege has been granted must register as a Candidate In Absentia and may work temporarily under the immediate supervision of an individual designated by the Special Committee. An In Absentia student's thesis research will continue to be directed by the Special Committee.

Leave of Absence

A candidate who finds it necessary to interrupt the continuity of his or her residence must petition the Associate Dean for an official leave of absence. This written petition must specify the term of absence, state the reason for the requested leave of absence, and be approved by the student's major sponsor.

Candidacy for Degree Only

A graduate student who has fulfilled all degree requirements, with the exception of the final thesis submission, and is no longer a full-time student, is granted Candidate for Degree Only status, which remains in effect until graduation. Degree conferral takes place three times per year, January, May and August, with the May commencement held jointly with M.D. degree graduates of Weill Medical College of Cornell University.

Examinations

Examinations required by the Weill Graduate School of Medical Sciences of Cornell University are: (1) Examination for Admission to Doctoral Candidacy, and (2) Final Examination for the Ph.D. degree. Ph.D. Examinations are administered by an Examining Committee consisting of a chairperson appointed by the Dean, the members of the candidate's Special Committee and one additional member from outside the student's Program of Study that is selected from either the Faculty of the Graduate School of Medical Sciences or from another institution.

The Admission to Doctoral Candidacy Examination is administered independently by each program, with attendant separate requirements. In addition to these examinations, the Program may require a qualifying examination as part of its evaluation of the candidate after two units of residence have been completed. The Admission to Doctoral Candidacy Examination is both oral and written and certifies that the student is eligible to present a thesis to the Graduate School of Medical Sciences. The examination should be taken after course work is largely finished but before significant thesis research has begun. Accordingly, the usual examination time will be at the end of the second year of residence. The examination may not be taken until two units of residence credit have been accumulated and a minimum of two units of residence credit is required after passing this examination before the final examination can be scheduled. The final examination for the Ph.D. degree is an oral defense of the candidate's thesis. It must be passed within four years after completion of the required residence units, or within seven years from the date of first registration, whichever is earlier.

Thesis

A principal requirement for the Ph.D. degree is the presentation of a thesis constituting an original contribution to the body of scientific research. Ordinarily, the thesis is written on a research topic in the candidate's major field of study, under the direction of the chairperson of his or her Special Committee. The time between the thesis defense and submission of the thesis in its final form is limited to 60 days. The Ph.D. thesis will be published in abstract and recorded on microfilm.

Financial Information

Tuition and Fees

Tuition and Stipend

All students accepted to Ph.D. degree-granting programs are awarded a full tuition scholarship of $20,800 per annum for 2000-01, which includes all tuition, tuition fees and health insurance costs. In addition to a full tuition scholarship, a generous graduate student stipend of $24,273 per annum is awarded to each full-time student.

Tuition for a full-time student matriculated in the Masters Degree Program in Clinical Epidemiology and Health Services Research is $21,000 for the entire program. However, students may matriculate and pay tuition on a per credit hour basis (currently $700/credit hour). Tuition includes fees for matriculation, graduation, and miscellaneous thesis expenses.

Other Fees

In Absentia. A student registered in absentia pays a fee of $200 each term (2 terms per annum).

Leave of Absence. Students on leave of absence will be required to pay an active-file fee of $200 per term, up to a maximum of six terms that they are not registered with the Graduate School. This fee will not be subject to finance charges but must be paid before the student can receive an advanced degree. Petition for waiver of this fee will be considered for students who have not completed the required number of residence units. For students on leave of absence, the student health plan will remain in force for 30 days following commencement of the leave.

Candidacy for Degree Only. A student who registers as a Candidate for Degree Only pays a one-time fee of $35.

Any individual who owes money to the University will not be allowed to register at the University, receive a transcript record, have academic credits certified, be granted a leave of absence, have a degree conferred or be eligible for health services and subsidized housing. The amount, time, and manner of payment of tuition, fees, or other charges may be changed at any time without notice.

Financial Assistance

Students who wish to apply for a Stafford Student Loan or other Federal assistance are required to submit a Free Application for Federal Student Aid (FAFSA) for an estimate of financial need. Application forms can be obtained from the Graduate School Office.

Limited financial assistance in the form of a student loan is available from the Graduate School to qualified applicants. Students are assisted in applying for competitive predoctoral fellowships available from sources such as the National Science Foundation, the National Research Council, and the Howard Hughes Medical Institute. These fellowships may be applied for directly from the Graduate School Office. Students who are awarded competitive fellowships will receive an additional $1,000 to be used for books and laboratory expenses. New York State residents are also eligible for several predoctoral fellowships applied for through the Graduate School.

Scholarships and Fellowships

Full fellowships are available for all graduate students. Recipients become Ph.D. Fellows and are awarded a full tuition scholarships and stipend support. Scholarships and fellowships are administered by the Office of the Graduate School of Medical Sciences.

The Vincent Astor Scholarship Fund. The generous gift by the Vincent Astor Foundation to the Graduate School of Medical Sciences and to the Medical College. Allocation of these funds for graduate students is made at the discretion of the Dean of the Graduate School of Medical Sciences.

The Harry E. Gould, Sr., Medical and Graduate Student Scholarship. This fund was established by Mr. Gould's son, Harry E. Gould, Jr., in memory of his father, a prominent business and civic leader in the City of New York who had a long-standing interest in medicine. The income from this endowment provides financial assistance for students of the Medical College and Graduate School of Medical Sciences.

The Frank L. Horsfall, Jr., Fellowships are derived from income generated by the Frank L. Horsfall, Jr. Fund and are awarded each year to two outstanding students sponsored by faculty members of the Sloan-Kettering Institute.

The Shirley L. Marshak Fellowship is funded by income derived from the Shirley L. Marshak Trust for Charities. The fellowship has been designated for award to a student of the Graduate School of Medical Sciences who is engaged in biomedical research.

DeCamp Tri-Institutional Neuroscience Fund. Through the generosity of the DeCamp Foundation, a fund has been established to promote neuroscience activities at the Weill Medical College of Cornell University, The Rockefeller University, and the Sloan-Kettering Institute. The gift supports an annual research symposium and graduate student and postdoctoral fellow research dinners.

Jacques Cohenca Predoctoral Fellowship. This Fellowship was created in 1999 by Mrs. Jacques Cohenca and family, in memory of Jacques Cohenca, to support doctoral candidates in the Weill Graduate School of Medical Sciences.

Margaret and Herman Sokol Predoctoral Fellowship. This endowed fellowship, funded by a generous gift from Mrs. Herman Sokol, supports doctoral candidates in the Weill Graduate School of Medical Sciences whose work concerns cardiovascular disease.

Awards and Prizes

The Julian R. Rachele Prize. The income of a fund established by Dr. Julian R. Rachele, former Dean of the Cornell University Graduate School of Medical Sciences, provides for an annual prize of $1,500 for the best research paper published during the year by a Ph.D. candidate.

The Vincent duVigneaud Prizes ($1,000), **Awards of Excellence** ($500), **and First Year Award** ($500) for the presentation of outstanding papers by students of the Weill Graduate School of Medical Sciences at the Annual Vincent duVigneaud Memorial Research Symposium.

Special Programs

PhD-MD Program

Ph.D. graduates of the Weill Graduate School of Medical Sciences of Cornell University may apply for admission to the Weill Medical College of Cornell University. A single admission per year from the Graduate School will be considered for highly qualified students. Graduate students in their 3rd year of graduate training may apply for the Ph.D.-M.D. program through the Associate Dean of the Graduate School of Medical Sciences. A letter of request from the student and a letter of recommendation from the student's thesis advisor are required. If accepted into the program, students will complete four major courses of the 1st year medical school curriculum: Human Structure and Function; Genes and Development; Host Defenses; and Medicine, Physicians and Society, during years 3,4, and 5 of graduate school. Pending successful completion, students may formally apply for admission to the Weill Medical College of Cornell University. Completion of coursework does not constitute a guarantee of acceptance to the medical college. If accepted, the Ph.D.-M.D. program student will enter the 2nd year of medical school. Unlike the Ph.D. degree program, the M.D. degree program is not supported by scholarship, making it incumbent on the accepted student to assume financial responsibility for all tuition and living expenses.

PhD-MBA Program

The Weill Graduate School of Medical Sciences is participating with the S.C. Johnson School of Management at Cornell University in Ithaca, NY to develop a joint Ph.D. -M.B.A. program. Following granting of a Ph.D. degree at the Graduate School of Medical Sciences, students may obtain a Masters Degree in Business Administration in a one year course of study from the Johnson School of Management pending acceptance by the Johnson School. Program details are available from the Graduate Office of the Weill Graduate School of Medical Sciences.

Cornell University Intercampus Student Exchange

Graduate students enrolled at the Weill Graduate School of Medical Sciences or at Cornell University in Ithaca may register for study with graduate faculty at either campus. Courses and research topics may be undertaken at either campus, depending on student need and resource availability.

Training Program in Chemical Biology

The Training Program in Chemical Biology is a joint undertaking between Cornell University - both the Ithaca campus and the Weill Medical College in New York City (NYC) - and The Rockefeller University and the Sloan-Kettering Institute in NYC. This new Cornell/Rockefeller/Sloan-Kettering Training Program in Chemical Biology (TPCB), will be available to a limited number of outstanding students who wish to work at the interface between chemistry and biology. The TPCB is part of a larger Tri-Institutional Program in Chemical Biology, which will draw upon the unparalleled resources that are available to the three institutions to create a unique research and educational environment. The Program will foster groundbreaking achievements in biomedical science by providing access to the most advanced state-of-the-art technologies and opportunities for discovery that none of the institutions alone could provide. For further information see the web page at http://www.med.cornell.edu/tpcb.

Summer Program for Minority Students

Internship for Under-Represented Minority College Students

(Under-represented Minority= African Americans, Native Americans, Alaskan Natives, Hispanics, Pacific Islanders)

The Weill Graduate School of Medical Sciences of Cornell University has established an internship program for training under-represented minority college students in the biomedical sciences. The aim of the program is to awaken and foster an interest in biomedical research and education. Students gain hands-on basic research experience with Graduate School faculty, in laboratories either at the Weill Medical College of Cornell University or the Sloan-Kettering Institute. Students also participate in a seminar course in career opportunities for doctorates in the biomedical sciences and a journal club. A stipend of $3,300, subsidized housing, and a travel allowance will be provided. Students must carry individual medical insurance for the period involved. This program is open to students who are interested in getting a Ph.D. degree and who have excelled in their freshmen, sophomore, or junior years in college. Applications must be received by February 1.

Register

Committees

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Antonio M. Gotto, Jr., Provost of Medical Affairs
David P. Hajjar, Dean
Joel D. Pardee, Associate Dean
Harold E. Varmus, Acting Director, Sloan-Kettering Division
Jerard Hurwitz, Director of Graduate Studies, Sloan-Kettering Division

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Francesca Domenech, Executive Committee
Andrea Basso, Executive Committee
Ryan Schreiner, Appeals
Samir Kelkar, Security and Housing
Garrett Day, Library

Continuing Students 2001-02

Candidates for the Degree of Doctor of Philosophy

[1] in absentia
[2] leave of absence
[3] candidate for degree only

Ahmed, Simi Tasnim (Immunology). B.A. 1995, Dartmouth College. Dhaka, Bangladesh.

Amprey, Joseph Leonard (Immunology). B.A. 1995, University of Pennsylvania. Baltimore, Maryland.

Appleby, Susan Blixt (Molecular Biology). B.S. 1988, Rochester Institute of Technology. Albany, New York.

Arora, Charanjit (Molecular Biology). B.S. 1999, University of California, Los Angeles. New Dehli, India.

Bailey, Christopher (Neuroscience). B.A. 1997, Occidental College. Boulder, Colorado.

Barton, William Alan (Molecular Biology). B.S. 1996, Virginia Commonwealth University. Fairfax, Virginia.

Basso, Andrea Dawn (Pharmacology). B.S. 1998, University of Richmond. New City, New York.

Beckett, Karen (Cell Biology and Genetics). B.Sc. 2000, Bristol University (United Kingdom). Edinburgh, United Kingdom.

Berman, Howard (Pharmacology). B.S. 1996, University of Michigan. Johannesburg, South Africa.

Bernal, Alejandro (Immunology). B.S. 1995, University of Houston. Ottawa, Canada.

Bickford, Lincoln (Biochemistry and Structural Biology). B.S. 1998, Stanford University. San Francisco, California.

[1]Biggins, John (Pharmacology). B.S. 1989, Fordham University. North Tarrytown, New York.

[1]Bililign, Tsion (Pharmacology). B.A. 1998, Virginia Polytechnic Institute and State College. Addis Abeba, Ethiopia.

Block, Ellen (Immunology). B.S. 1995, Massachusetts Institute of Technology. New York, New York.

Bogulavsky, Johanna Julie (Neuroscience). B.M. 1993, Northwestern University. New York, New York.

Bolan, Elizabeth (Neuroscience). B.S. 1991, University of Scranton. Haverhill, Massachusetts.

Breitman, Marianna I. (Biochemistry and Structural Biology). B.A. 1999, Princeton University. St. Petersburg, Russia.

Bruno, Michael John (Biochemistry and Structural Biology). B.A. 1999, Dartmouth College. Milford, Connecticut.

Bubman, Darya (Pharmacology). B.A. 2000, Cornell University. Moscow, Russia.

Bullock, Michael John (Pharmacology). B.S. 1996, Indiana University. South Bend, Indiana.

Burakov, Darya (Cell Biology and Genetics). B.A. 1994, Technion University (Israel); M.Sc. 1996, Weizman Institute (Israel). Moscow, Russia.

Bussell, Jr., Robert George (Physiology, Biophysics and Molecular Medicine). B.S. 1996, Carnegie Mellon; M.A. 1998, University of Texas. Philadelphia, Pennyslvania.

Chaloupka, James Anthony (Pharmacology). B.A. 1994, New York University; M.H.S. 1997, Johns Hopkins School of Hygiene & Public Health. Amityville, New York.

Chamorro, Mario (Cell Biology and Genetics). B.A. 1979, University of California, Berkeley. Granada, Nicaragua.

Capiaux, Gina Marie (Pharmacology). B.A. 1991, California State University, Fresno. San Francisco, California.

[2]Carton, John Charles (Neuroscience). B.A. 1995, Johns Hopkins University. New York, New York.

Castelo, Leslie Ann (Cell Biology and Genetics). B.A. 1997, Harvard University. New York, New York.

Chang, Pearl (Molecular Biology). B.A. 1993, University of California, Berkeley. Taipei, Taiwan.

Chen, Jian (Pharmacology). B.S. 1997, Tsinghua University (People's Republic of China). Zhejiang, China.

Chen, Lian (Pharmacology). B.S. 1994, Ohio State University. Suzhou, People's Republic of China.

Chen, Xu (Biochemistry and Structural Biology). B.S. 1992; M.S. 1995, Tsinghua University (People's Republic of China). Yancheng, People's Republic of China.

Chen, Yunbo (Neuroscience). B.S. 1995, Peking University (People's Republic of China). Yingkou, People's Republic of China.

Chesnutt, Catherine (Neuroscience). B.S. 1994, College of William and Mary. Columbia, South Carolina.

Chmielnicki, Eva Janet (Neuroscience). B.A. 1998, University of Pennyslvania. Bronx, New York.

Choe, Kwang-Min (Molecular Biology). B.S. 1992, Yonsei University (South Korea); M.S. 1996, New York University. Inchon, Korea.

Cohen, Alona (Biochemistry and Structural Biology). B.A. 1997, University of California, Berkeley. Netanya, Israel.

Coleman, Jeffrey (Clinical Epidemiology). B.A. 1989, Union College. New York, New York.

Cox, Virginia Taylor (Molecular Biology). B.S. 1998, Wake Forest University. Raleigh, North Carolina.

Darken, Rachel Susanna (Cell Biology and Genetics). B.A. 1996, University of Texas. Knoxville, Tennessee.

Dasgupta, Bidisha (Immunology). B.S. 1999, Case Western Reserve. Winchester, Massachusetts.

Day, Jr., Garrett (Pharmacology). B.S. 1994, Duke University. Falls Church, Virginia.

DeBellis, Robert (Neuroscience). B.A. 1997, Cornell University. New York, New York.

Dedesma, Carlos Alberto (Neuroscience). B.S. 1996, Duke University. Belleville, New Jersey.

DiBartolo, Daniel Luca (Cell Biology and Genetics). B.A. 1995, Boston College. Boston, Massachusetts.

Diraviyam, Karthikeyan (Biochemistry and Structural Biology). B.Tech 2000, Anna University (India). Madurai, India.

Do, Gian (Immunology). B.S. 1990, Cornell University. Vietnam.

Domenech, Francesca (Pharmacology). B.A. 1995, Cornell University. New York, New York.

Douglas, Leonille (Cell Biology and Genetics). M.S. 1999, New York University. Munich, Germany.

Du, Zhemei (Immunology). M.D. 1993, Beijing Medical University (People's Republic of China). Beijing, People's Republic of China.

Duan, Fei (Immunology). B.S. 1996, Fudan University (People's Republic of China). Tong Ling, People's Republic of China.

Fallas, Jennifer Lynn (Cell Biology and Genetics). B.A. 1994, Rutgers College. Schenectady, New York.

Fernandez-Alfonso, Tomas (Neuroscience). Licenciado 1999, University of Buenos Aires (Argentina). Buenos Aires, Argentina.

Friedman, Debbie (Pharmacology). B.A.; A.A. 1995, Yeshiva University/Stern College. New York, New York.

Gade, Terence (Physiology, Biophysics and Molecular Medicine). B.A. 1998, University of Michigan. New York, New York.

Gamble, Matthew Jon (Cell Biology and Genetics). B.A. 1998, Rutgers University. Milford, New Jersey.

[3]Gilbert, Matthew Timmerman (Physiology, Biophysics and Molecular Medicine). B.A. 1990, Oberlin College. Ithaca, New York.

Gillespie, Robert (Cell Biology and Genetics). B.S. 1994, University at Albany; M.S. 1997, University of Central Florida. Port Jefferson, New York.

Giordano, Jennifer (Molecular Biology). B.Sc. 1999, University of Alberta (Canada). Edmonton, Canada.

Gong, Chunling (Cell Biology and Genetics). B.S. 1997, China Medical University (People's Republic of China). Hengshui City, People's Republic of China.

Gonzalez, Katie (Cell Biology and Genetics). B.A. 1995, Grinnell College. Grinnell, Iowa.

Gorfajn, Barbara (Pharmacology). B.S. 1997, State University of New York. Binghamton, New York.

Gregus, Ann Marie (Pharmacology). B.S. 1998, Villanova University. Westwood, New Jersey.

Guo, Wenjun (Cell Biology and Genetics). B.S. 1994, Nankai University (People's Republic of China). Guangchang, People's Republic of China.

Hamilton, Henry (Molecular Biology). B.S./B.A. 1995, Brigham Young University. St. George, Utah.

Han, Hyunsil (Immunology). B.S. 1991, Yonsei University (Korea); M.S. 1997 San Diego State University. Seoul, Korea.

Hao, Gang (Pharmacology). B.S. 1997, Nankai University (People's Republic of China). Tianjin, China.

Hassing, Heide Murphy Girardin (Biochemistry and Structural Biology). B.A. 1997, Colby College, Fairbanks, Alaska.

Helgadottir, Hildur Rut (Cell Biology and Genetics). B.S. 1998, Univeristy of Iceland (Iceland). Reyjavik, Iceland.

Henderson, Kiersten Amie (Cell Biology and Genetics). B.S.c. 2000, McGill University (Canada). Ottawa, Canada.

Ho, Hao (Physiology, Biophysics and Molecular Medicine). B.A. 1993; M.A. 1993, Washington University. Sabah, Malaysia.

Hsia, Constance (Immunology). B.A. 1992, University of California, Berkeley. Lansing, Michigan.

Hsieh, Anita Yuan-Fan (Molecular Biology). B.A. 1998, Columbia University. Parsippany, New Jersey.

Hu, Xiaoyu (Immunology). B.M. 1997, Beijing Medical University (People's Republic of China). Beijing, China.

Hu, Yang (Neuroscience). B.M. 1996, Beijing Medical University (People's Republic of China). Beijing, People's Republic of China.

Huang, Wei (Physiology, Biophysics and Molecular Medicine). B.S. 1993; M.S. 1995, University of Science and Technology (People's Republic of China). Chengdu, People's Republic of China.

Huang, Yihua (Physiology, Biophysics and Molecular Medicine). B.S. 1995, Peking University (People's Republic of China). Shaoyang, China.

Huangfu, Danwei (Neuroscience). B.S. 1997, Fudan University (People's Republic of China). Shanghai, People's Republic of China.

Huard, Richard (Immunology). B.Sc. 1994, University of Guelph (Canada). Ajax, Canada.

Huron, David Robert (Pharmacology). B.A. 1999, Texas Technical University. Charleston, South Carolina.

Im, Wonpil (Biochemistry and Structural Biology). M.S. 1996, Hanyang University (Seoul, Korea). Seoul, Korea.

Jiang, Yun (Physiology, Biophysics and Molecular Medicine). B.S. 1993, Sichuan University (People's Republic of China). Wanxian, People's Republic of China.

Johnson, Robert Anthony (Neuroscience). B.A. 1992, Johns Hopkins University; M.A. 1996, New York University. Brooklyn, New York.

Joo, Woo (Molecular Biology). B.A. 1993, Tufts University. Eoryung, South Korea.

Kalik, Steven (Neuroscience). B.S. 1994, Cornell University. New York, New York.

Kamenetsky, Margarita (Pharmacology). B.S. 2000, State University of New York at Stony Brook. Kiev, Ukraine.

Kaplan, Theodore (Neuroscience). B.S. 1997, University of Pittsburgh. Rochester, New York.

Karylowski, Ola Julia (Biochemistry and Structural Biology). B.A. 1999, New College. Warsaw, Poland.

Kash, Thomas (Neuroscience). B.S. 1999, State University of New York, College of Environmental Sciences. Port Jefferson, New York.

Kc, Sagun (Pharmacology). B.S. 2000, Bates College. Kathmandu, Nepal.

Kee, Kehkooi (Molecular Biology). B.S.; M.S. 1997, Iowa State University. Sitiawan, Malaysia.

Kelkar, Samir A. (Physiology, Biophysics and Molecular Medicine). B.S. 1999, Brown University. Americus, Georgia.

Keller, Shannon Ann (Immunology). B.S. 1995, University of Maryland. Baltimore, Maryland.

Kelly, Kristine Ann (Cell Biology and Genetics). B.A. 1998, Tufts University. Rumson, New Jersey.

Keyoung, Hansoo Michael (Neuroscience). B.S. 1996, State University of New York, Binghampton. Seoul, Korea.

Kharode, Anup Y. (Pharmacology). B.S. 1999, Penn State University. Fort Worth, Texas.

Khoo, Alan Soo Beng (Molecular Biology). M.B.B.S. 1989, University of Malaysia (Malaysia). Seremban, Malaysia.

Kim, Edmund (Immunology). B.A. 1994, Pomona College. Los Angeles, California.

[2,3]Kim, Seul-Ki (Molecular Biology). B.Sc. 1995, Seoul National University. Seoul, Korea.

Kim, Sunjung (Immunology). B.S. 1995, Seoul Women's University (Korea). Seoul, Korea.

Kim, Tae Hee (Cell Biology and Genetics). B.S. 1996, Sung Kyun Kwan (Korea). Seoul, Korea.

Kim, Yoon-Seong (Neuroscience). M.D. 1993, Kyung-Hee University (Korea). Seoul, Korea.

Kim, Young-Hwa (Immunology). B.S. 1994, Korea University (Korea); M.S. 1997, Seoul National University (Korea). Daejeon, Korea.

Klein, Arno Timothy (Neuroscience). B.S. 1993, University of Michigan; M.S. 1998, California Institute of Technology. Southfield, Michigan.

Kolinsky, Monica (Pharmacology). B.S. 1997, Moravian College. Easton, Pennsylvania.

Kreishman-Deitrick, Mara (Biochemistry and Structural Biology). B.S. 1998, University of Cincinnati. Cincinnati, Ohio.

Kutluay, Esin (Biochemistry and Structural Biology). B.S. 1999, Bilkent University (Turkey). Hatay, Turkey.

Lampson, Michael (Physiology, Biophysics and Molecular Medicine). A.B. 1994, Harvard University. Palo Alto, California.

Le, Hong-Van (Cell Biology and Genetics). B.S. 2000, Massachusetts Institute of Technology. Vietnam.

Lee, Juliane (Physiology, Biophysics and Molecular Medicine). B.A. 1989, Smith College; M.D. 1994, University of Wisconsin. Milwaukee, Wisconsin.

Lee, Karen Myra (Cell Biology and Genetics). B.A. 1993, Columbia University. Teaneck, New Jersey.

Lee, Mona Duh-Wei (Pharmacology). B.A. 1992, University of California, Berkeley. Brea, California.

Lee, Ramee (Neuroscience). B.S. 1995, Duke University. Seoul, Korea.

Leibowitz, Evan (Clinical Epidemiology). M.D. 1996, The University of Medicine and Dentistry of New Jersey. New Brunswick, New Jersey.

Lesniak, Jacob Andrew (Pharmacology). B.S. 1999, St. John's University. Cracov, Poland.

[1]Leu, Frank Pou (Pharmacology). B.A. 1994, State University of New York, Binghamton, Kao-Shihn City, People's Republic of China.

Leung, Daisy (Biochemistry and Structural Biology). B.A. 1997, Amherst College. Los Angeles, California.

Li, Haiqing (Cell Biology and Genetics). B.S. 1995, Beijing Medical University (People's Republic of China). Shanghai, People's Republic of China.

Liao, Jack Chia-Fun (Pharmacology). B.A. 1994, University of California, Berkeley. Taipei, Taiwan.

Lin, Yixin (Biochemisttry and Structural Biology). B.S. 1992, Peking University (People's Republic of China). Nanchong, People's Republic of China.

Lindwasser, Onn Wolf (Cell Biology and Genetics). B.S. 1998, Hunter College. New York, New York.

Link, Lilli Beth (Clinical Epidemiology). M.D. 1994, University of Chicago. New York, New York.

Litvin, Tatiana (Pharmacology). B.A. 1998, Clark University. St. Petersburg, Russia.

Lou, Olivia (Immunology). B.Sc. 1997, University of Alberta (Canada). Edmonton, Canada.

Louissant, Jr., Abner (Neuroscience). B.A. 1997, Washington University. Queens, New York.

Lowry, William (Neuroscience). B.S. 1996, University of Washington. Seattle, Washington.

Lu, Yiran (Molecular Biology). B.S. 1994, Tsinghua University (People's Republic of China). Jiangsu, People's Republic of China.

Lyddane, Clay Earl (Immunology). B.S. 1996, University of Kansas, Winterset, Iowa.

Lytle, Jennifer Robin (Biochemistry and Structural Biology). B.S. 1995, Clemson University. Agana, Guam (U.S.A.)

Magro, Pellegrino (Pharmacology). B.S. 1996, State University of New York, Stony Brook. New York, New York.

Maksimova, Mayya (Pharmacology). B.S. 1995, St. Petersburg State University (Russia). St. Petersburg, Russia.

Maninno, Christy A. (Pharmacology). B.S. 1999, State University of New York, Binghampton. Buffalo, New York.

Manning-Strope, Sharon Denise (Molecular Biology). B.S. 1996, Emory University. Jacksonville, Florida.

Maroni, Jaman (Clinical Epidemiology). M.D. 1991, Albert Einstein College of Medicine of Yeshiva University. Detroit, Michigan.

Martin, Deborah Mary (Neuroscience). B.A. 1997, College of Holy Cross. Boston, Massachusetts.

McGrath, Melissa Suzanne (Immunology). B.S. 1996, Union College. Albany, New York.

Miller, Jeffrey (Cell Biology and Genetics). B.S. 2000, University of Delaware. York, Pennsylvania.

Mody, Roshni (Pharmacology). B.S. 1996, Carnegie Mellon University. New York, New York.

Moench, Paul Andrew (Pharmacology). B.S. 1998, State University of New York, Stony Brook. Selden, New York.

Moody, Karen (Clinical Epidemiology). M.D. 1996, State University of New York, Health Science Center at Syracuse. Rochester, New York.

Moskowitz, Howard (Biochemistry and Structural Biology). B.S. 1998, Cornell University. Queens, New York.

Munoz, Claudia (Molecular Biology). B.A. 1999, Swarthmore College. Lima, Peru.

Ng, Simne (Pharmacology). B.A. 1999, Drew University. Hong Kong.

Nguyen, Hoang (Molecular Biology). B.A. 1991, Cornell University; M.S. 1995, Johns Hopkins University. Vietnam.

Nguyen, Kha Chi (Neuroscience). B.S.; B.A. 1993, University of Rochester. Saigon, Vietnam.

Nguyen, Thomas (Molecular Biology). B.S. 1995, Harvard University. Saigon, Vietnam.

Nunez, Jennifer (Neuroscience). B.A. 1994, Barnard College. Erie, Pennsylvania.

Owyang, Alexander (Immunology). B.A. 1992, University of California, Berkeley. San Francisco, California.

Panaghie, Gianina (Pharmacology). B.S. 1996, "AL.I.CUZA" University of Jassy (Romania). Birlad, Romania.

Pastore, Raymond David (Clinical Epidemiology). A.B. 1991, Princeton University; M.D. 1995, New York University School of Medicine. Brooklyn, New York.

Pei, Yi (Molecular Biology). B.S. 1993, Nanjing University (People's Republic of China). Liu Zhi, People's Republic of China.

Pitt, Stephen (Pharmacology). B.S. 1996, Trinity College. Manchester, Connecticut.

Poynor, Elizabeth (Cell Biology and Genetics). A.B. 1984, Princeton University; M.D. 1988, Columbia University. Nashville, Tennessee.

Pugach, Pavel (Immunology). B.A. 1997, Rutgers University. St. Petersburg, Russia.

Pylayeva, Yuliya (Cell Biology and Genetics). B.S. 2000, State University of New York, Stony Brook. Baku, Azerbaijan.

Rakeman, Andrew (Cell Biology and Genetics). B.A. 1998, Boston University. Rockville Centre, New York.

Ramirez-Montagut, Teresa (Immunology). M.D. 1997, University Nacional Autonoma de Mexico (Mexico). Mexico.

Raspberry, Dara Folami (Molecular Biology/Cell Biology and Genetics). B.A. 1992, Harvard University. Bronx, New York.

Refik-Rogers, Jale (Molecular Biology). B.S. 1998, University of Maine. Nicosia, Cyprus.

Repucci, Michael Anthony (Neuroscience). B.S. 1998, College of William and Mary. Bethesda, Maryland.

Robbiani, Davide Filippo (Immunology). M.D. 1998, Bern Medical School (Switzerland). Lugano, Switzerland.

Roberts, Wendy Katherine (Pharmacology). B.A. 1996, Clark University. Waltham, Massachusetts.

Rodriguez-Moreno, Diana Virginia (Neuroscience). B.S. 1994, Universidade de Buenos Aires (Argentina). Buenos Aires, Argentina.

Romero, Elizabeth Ejercito (Physiology, Biophysics and Molecular Medicine). B.S. 1997, Massachusetts Institute of Technology. Bronx, New York.

Rouzankina, Iaroslava (Molecular Biology). M.Sc. 1995, Novosibirsk State University (Russia). Novosibirsk, Russia.

Russo, Angelo (Pharmacology). B.S. 1997, State University of New York, Stony Brook. Queens, New York.

Ruzinova, Marianna (Cell Biology and Genetics). B.A. 1998, Swarthmore College. Philadelphia, Pennsylvania.

Sahota, Sukhvinder (Immunology). B.A. 1998, Rutgers University. London, United Kingdom.

Sanders, Quentin J. (Cell Biology and Genetics). B.S. 1996, Lander University. Athens, Georgia.

Sawaya, Rana (Molecular Biology). B.Sc. 1996; M.Sc., 1998, McGill University (Canada). Montreal, Canada.

Schofield, Claude (Pharmacology). B.S. 1997, University of Wisconsin. Chicago, Illinois.

Seth, Abhinav (Biochemistry and Structural Biology). A.B./ A.M. 1998, Harvard University. Teaneck, New Jersey.

Seto, Jeremy (Neuroscience). B.A. 1998, Rutgers College. Queens, New York.

Shan, Dandan (Physiology, Biophysics, and Molecular Medicine). B.S. 1997, Peking University (People's Republic of China). Shanxian, People's Republic of China.

Shapiro, Risa Sara (Molecular Biology). B.S. 1999, Cornell University. Lake Success, New York.

Shen, Lijian (Physiology, Biophysics & Molecular Medicine). B.S. 1997, Peking University (People's Republic of China). Beijing, People's Republic of China.

Shi, Shuangping (Immunology). B.S. 1995, Nanjing University (People's Republic of China). Harbin, People's Republic of China.

Skacel, Nancy Elizabeth (Pharmacology). B.A. 1988, Johns Hopkins University. New York, New York.

Soper, Bryan Richard (Molecular Biology). B.A. 1997, University of California, Berkeley. Villa Park, California.

Staeva, Teodora Petrova (Immunology). B.A. 1995, Macalester College. Sofia, Bulgaria.

Stolzer, Amy Lynn (Immunology). B.A. 1993, SUNY Purchase. New York, New York.

Su, Wendy (Pharmacology). B.A. 1994, Colgate University. Kanshiung, Taiwan.

Suh, Eun-Kyung (Neuroscience). B.A. 1994, Wellesley College. Seoul, Korea.

Sun, Yutong (Physiology, Biophysics, and Molecular Medicine). B.S. 1997, Tsinghua University (People's Republic of China). Heilongjiang, People's Republic of China.

Talati, Ardesheer (Pharmacology). B.A. 1995, Grinnell College. Karachi, Pakistan.

Tapanes, Alexis (Molecular Biology). B.S. 1998, University of Miami. Miami, Florida.

Tian, Ligeng (Molecular Biology). B.S. 1996, Beijing Medical University (People's Republic of China); M.S. 1999, University of Illinois. Harbin, People's Republic of China.

Torigoi, Emi (Molecular Biology). B.S. 1992, Universidade Estaduale de Campinas (Brazil); M.S. 1996, University of Sao Paulo (Brazil). Sao Paulo, Brazil.

Torres, Eduardo (Physiology, Biophysics and Molecular Medicine). B.S. 1997, City College. Peru.

Tsai, Jeffrey Jen-Chieh (Neuroscience). B.S.E. 1993, Duke University. Kaohsiung, Taiwan.

Turner, Brian (Neuroscience). B.S. 1990, Curtin University. Perth, Australia.

Vijayvergiya, Chetan (Neuroscience). B.S. 1994, University of Texas. Houston, Texas.

Vonica, Alin (Molecular Biology). M.D. 1986, Cluj-Napoca Medical School (Romania). Cluj-Napoca, Romania.

Wolf, Rebecca (Cell Biology and Genetics). B.A. 1996, Manhattan Institute of Technology. New York, New York.

Wong, Amy (Pharmacology). B.S. 1997, McGill University (Canada). Hong Kong.

Wu, George (Cell Biology and Genetics). B.A. 1992, University of California, Berkeley; M.A. 1994, Stanford University. Taipei, Taiwan.

Wu, Karen (Pharmacology). B.S. 2000, Rutgers University. Taiwan, Republic of China.

Wysocki, Carrie (Cell Biology and Genetics). B.A. 1997, New York University. Syracuse, New York.

Xu, Juliana (Pharmacology). B.S. 1997, Grove City College. Tianjin, China.

Xu, Lei-Wei (Biochemistry & Structural Biology). B.S. 1984, Nanjing Normal University (People's Republic of China). Changzhou, People's Republic of China.

Yang, Haijuan (Pharmacology). B.S. 1993, Beijing Medical University (People's Republic of China); M.S. 1996, University of Arkansas. Tianjin, People's Republic of China.

Yousef-Martinek, Diana (Biochemistry and Structural Biology). A.B. 1994, Harvard University. Boston, Massachusetts.

Zambenedetti, Maurizio (Clinical Epidemiology). M.D. 1981, Universita Degli Studi Di Padova (Italy). Venice, Italy.

Zhang, Na (Pharmacology). B.S. 1989, Nankai University (People's Republic of China). Beijing, People's Republic of China.

Zhang, Xiaowei (Cell Biology and Genetics). M.D. 1988. Shanghai Medical University (People's Republic of China). Shanghai, People's Republic of China.

Zheng, Yufang (Physiology, Biophysics and Molecular Medicine). B.S. 1997, Tsinghua University (People's Republic of China). Nanjing, People's Republic of China.

Zhu, Jing (Pharmacology). B.S. 1993, Beijing Medical University (People's Republic of China); M.S. 1995, University of Connecticut Health Center. Beijing, People's Republic of China.

Zippin, Jonathan (Pharmacology). B.S. 1998, Cornell University. Fort Lauderdale, Florida.

[1] in absentia
[2] leave of absence
[3] candidate for degree only

Candidates for the Degree of Master of Science

Coleman, Jeffrey (Clinical Epidemiology). B.A. 1989, Union College. New York, New York.

Link, Lilli Beth (Clinical Epidemiology). M.D. 1994, University of Chicago. New York, New York.

Pastore, Raymond David (Clinical Epidemiology). A.B. 1991, Princeton University; M.D. 1995, New York University, School of Medicine. Brooklyn, New York.

Zambenedetti, Maurizio (Clinical Epidemiology). M.D. 1981, Universita Degli Studi Di Padova (Italy). Venice, Italy.

Entering Students 2001-02

Afflick, Wauldron Ronaldo (Molecular Biology). B.S. 2001, Delaware State University. Kington, Jamaica.

Alarcon, Claudio R. (Cell Biology and Genetics). B.S. 1998, Pontificia Universidad Catolica De Chile (Santiago, Chile). Santiago, Chile.

Anantharam, Arun (Neuroscience). B.A. 1998, Columbia University. Madras, India.

Arca, Turkan (Molecular Biology). B.S. 2001, University of Wisconsin. Nicosia, Cyprus.

Barna, Maria A. (Molecular Biology). B.A. 1996, New York University. Belgium.

Begum, Hajira (Neuroscience). B.S. 2001, Worcester Polytechnic Institute. Hyderabad, India.

Belostocki, Kristina (Clinical Epidemiology). B.A. 1991; M.D. 1995, New York University. Forest Hills, New York.

Carlile, Graeme William (Cell Biology and Genetics). B.Sc. 1989, Queens University. Belfast, United Kingdom.

Chang, Yong En (Physiology, Biophysics and Molecular Medicine). B.S. 2001, Fudan University Medical Center Shanghai, People's Republic of China.

Chung, Elaine Yee Lin (Immunology). B.A. 2000, University of Chicago. Hong Kong.

Col, Seda (Cell Biology and Genetics). B.S. 2001, Bilkent University. Gaziantep, Turkey.

Draghi, Nicole Anne (Biochemistry and Structural Biology). B.A. 2000, Williams College. New York, New York.

Dunn, Matthew Patrick (Molecular Biology). B.S.E. 1998, University of Pennsylvania. Camden, New Jersey.

Farrell, Jeanne Marie (Pharmacology). B.S. 1999; M.S. 2001, Fordham University. Long Beach, California.

Fernandez, Cristina Carmen (Pharmacology). B.A. 2001, Rutgers University. Belleville, New Jersey.

Garrick, Jocelyn Freeman (Clinical Epidemiology). B.A. 1991, University of California at Berkeley; M.D. 1997, University of Southern California School of Medicine. San Francisco, California.

Galvan, Adriana (Neuroscience). B.A. 2001, Barnard College. Santa Barbara, California.

Gordon, Earl Anthony (Pharmacology). B.Sc. 1994; M.Phil. 1999, The University of the West Indies (Mona, Jamaica).

Gu, Meigang (Biochemistry and Structural Biology). B.S. 1998, Fudan University (Shanghai, People's Republic of China). Shanghai, People's Republic of China.

Han, Jin-Hwan (Immunology). B.S. 1997; M.S. 1999, Yonsei University (Seoul, South Korea). Seoul, South Korea.

Hara, Yuko (Neuroscience). B.S. 2001, Cornell University (Ithaca, New York). Kyoto, Japan.

Heller, Ryan C. (Molecular Biology). B.A. 1999, Boston University. Long Island, New York.

Hu, Xiaoyi (Cell Biology and Genetics). M.S. 1998, The College of Medicine of Nankai University (Tianjin, People's Republic of China). Pengzhou, People's Republic of China.

Jaggi, Jaspreet Singh (Pharmacology). M.B.B.S. 1999, Grant Medical College (Bombay, India). Patiala, India.

Kamen, Lynn Anne (Immunology). B.A. 2001, Wheaton College. Norwood, Massachusetts.

Kappel, Barry Jay (Pharmacology). B.A. 1998, Emory University. Queens, New York.

Kawamata, Hibiki (Neuroscience). B.A. 1999, Smith College. Tokyo, Japan.

Kleinberg, Hilary Bara (Cell Biology and Genetics). B.A. 1995, Amherst College. Smithtown, New York.

Kwong, Jennifer Quo-Yee (Neuroscience). B.A. 1999, Cornell University (Ithaca, New York). East York, Canada.

Lee, Hyojin (Molecular Biology). B.S. 1997; M.S. 1999, Seoul National University (Seoul, Korea). Pusan, Korea.

Lee, Sung Won (Clinical Epidemiology). B.A. 1992, Brown University; M.Phil. 1993, University of Cambridge; M.D. 1997, University of California at San Francisco. Seoul, Korea.

Lisowski, Leszek (Cell Biology and Genetics). B.S. 2001, University of Bridgeport. Walcz, Poland.

Ma, Li (Physiology, Biophysics and Molecular Medicine). B.S. 2001, Peking University (Beijing, People's Republic of China). Jingdezhen, People's Republic of China.

Madden, Clement T. (Molecular Biology). B.S. 1997, University of New Hampshire. Weymouth, Massachusetts.

Maiolatesi, Tia Marie (Molecular Biology). B.S. 1999, Dickinson College. Scranton, Pennsylvania.

McGarrigle, Deirdre Kathleen (Physiology, Biophysics and Molecular Medicine). B.Sc. 2000, University College Dublin (Dublin, Ireland). Dublin, Ireland.

Moorthy, Lakshmi Nandini (Clinical Epidemiology). M.B.B.S. 1995, Maulana Azad Medical College, Delhi University (New Delhi, India). Pune, India.

Murray, Paul Sebastian (Biochemistry & Structural Biology). B.S. 2001, Colgate University. Mt. Kisco, New York.

Park-Min, Kyung-Hyun (Immunology). B.A. 1993; M.S. 1995 Korea University (Seoul, Korea). Seoul, Korea.

Phillips, Erica Gwendolyn (Clinical Epidemiology). M.D. 1998, Columbia University; B.A. 1994, University of Virginia. U.S.A.

Potuzak, Justin Stephen (Pharmacology). B.A. 2000, Drew University. West Islip, New Jersey.

Reid, Alicia Candice (Physiology, Biophysics and Molecular Medicine). B.S. 2001, Virginia Union University. Baltimore, Maryland.

Rotolo, Jimmy Andrew (Pharmacology). B.S. 1999, Emory University. Brooklyn, New York.

Ruscito, Brian Joseph (Pharmacology). B.A. 1997, Davidson College. Springfield, Massachusetts.

Tian, Jing (Biochemistry and Structural Biology). B.S. 1999, Shandong University (Jinan, People's Republic of China). Zibo, People's Republic of China.

Touma, Sue Ellen Khalil (Pharmacology). B.S. 2000, Merrimack College. Methuen, Massachusetts.

Towart, Laura Anne (Neuroscience). B.S./B.A. 1999, The George Washington University. Queens, New York.

Valiathan, Rajeshwari Rajan (Molecular Biology). B.Tech. 2001. Indian Institute of Technology (Kharagpur, India). Mavelikara, India.

Vandal, Omar Haider (Immunology). B.A. 1999. The College of Wooster. Lahore, Pakistan.

Wang, Shiyang (Physiology, Biophysics and Molecular Medicine). B.M. 1994, Shanghai Second Medical University (Shanghai, People's Republic of China). Shanghai, People's Republic of China.

Wong, Ming-Ching (Cell Biology and Genetics). B.Sc. 2001, McGill University (Montreal, Canada). Kuala Lumpur, Malaysia.

Xu, Guozhou (Immunology). B.S. 1994, East China Nornal University (Shanghai, People's Republic of China); M.S. 1997, Fudan University (Shanghai, People's Republic of China). Anhui, People's Republic of China.

Xu, Kai (Neuroscience). B.S. 1998, Xiamen University (Xiamen, Fujian, People's Republic of China). Fuzhou, People's Republic of China.

Yan, Weisi (Pharmacology). B.S. 2001, China Medical University (Shenyang, People's Republic of China). Mudanjiang, People's Republic of China.

Yurttas, Piraye (Molecular Biology). B.S./B.A. 2001, University of Texas at Austin. Izmir, Turkey.

Zarifyan, Alla S. (Pharmacology). B.S. 2001, Cornell University (Ithaca, New York). Tbilisi, U.S.S.R.

Zhu, Hui (Biochemistry and Structural Biology). B.S. 2000, Peking University Health Science Center (Beijing, People's Republic of China). Haimen, People's Republic of China.

DEGREE RECIPIENTS 2000-2001

DOCTORS OF PHILOSOPHY

Adamo, Joan E., B.S., 1996, Cornell University. Molecular Biology, Professor Patrick Brennwald. Thesis: "Rho3 and Cdc42 Function in Polarized Exocytosis."

Aghazadeh, Behzad, Diploma, 1995, Ludwig-Maximilians University (Germany). Physiology, Biophysics and Molecular Medicine, Professor Michael Rosen. Thesis: "Structural Characterization of the Rho - GTPase Activating Db1 Homology Domain."

Bennett II, Richard L., B.A., 1993, Kalamazoo College. Molecular Biology, Professor William Holloman. Thesis: "Overexpression and Characterization of the Ustilago Maydis Rec2 Protein."

Bromleigh, Virginia Carrington, B.A., 1987, New York University; M.S., 1991, New York University. Cell Biology and Genetics, Professor Leonard Freedman. Thesis: "Complex Regulation of the p21 Promoter During Myeloid Differentiation."

Cai, Hui L., B.S., 1990, Sichuan University (People's Republic of China). Cell Biology and Genetics, Professor Carl Blobel. Thesis: "Evaluation of the Role of Metalloprotease - Disintegrins During Mouse and Xenopus Development."

DeMasi, Joseph, B.S., 1995, Carnegie Mellon University. Molecular Biology, Professor Paula Traktman. Thesis: "Vaccinia Virus Replication: Genetic Analysis of the H5 Phosphoprotein and Identification of Viral Telomere Binding Proteins."

Gitig, Diana Marcie, B.A., 1994, University of Pennyslvania. Cell Biology and Genetics, Professor Andrew Koff. Thesis: "Molecular Interactions between p27KIP1 and p21CIP1 and G1 Cyclin/Cdk Complexes."

Hohl, Tobias Martin*, B.S., 1993, Duke University. Biochemistry & Structural Biology, Professor James Rothman. Thesis: "Structural Analysis of 20 S Particles Consisting of NSF, SNAPs, and SNARE Complexes (Part I). Studies toward a Genetically Encodable Optical Probe of Membrane Potential (Part II)."

Kalantry, Sundeep, B.A., 1993, Cornell University. Cell Biology and Genetics, Professor Elizabeth Lacy. Thesis: "Identification and Characterization of the Amnionless Gene."

Khursigara, Gus H., B.A., 1991, University of California at San Diego. Neuroscience, Professor Moses V. Chao. Thesis: "NGF Signaling in Schwann Cells: Identification of Two p75 Interacting Proteins."

Lehman, Kevin, B.S., 1991, Fordham University. Neuroscience, Professor Stewart Shuman. Thesis: "A Biochemical and Genetic Analysis of Fungal RNA Triphosphatase."

Lennon, David James, B.A., 1993, Columbia University. Cell Biology and Genetics, Professor Roy L. Silverstein. Thesis: "Signaling Through the Scavenger Receptor CD36: Identification of CD36 - Dependent Pathways in Macrophages Activated by Modified Low Density Lipoproteins."

Levine, Cindy, B.S., 1990, Cornell University. Molecular Biology, Professor Kenneth Marians. Thesis: "Identification and Analysis of High-Copy Suppressors of Topo IV Mutations."

Lo, Roger Sheng-chieh*, B.S., 1994, Stanford University. Cell Biology and Genetics, Professor Joan Massagué. Thesis: "Specificity Determination and Regulation of SMAD Proteins in TGF? Signaling."

Ma, Yong-Chao, B.S., 1992, Peking University (People's Republic of China); M.S., 1996, Peking University (People's Republic of China). Physiology, Biophysics and Molecular Medicine, Professor Xin-Yun Huang. Thesis: "Regulation of Non-Receptor Tyrosine Kinases by Heterotrimeric G-Proteins."

May, Chad Michael, B.S., 1993, University of Minnesota. Molecular Biology, Professor Michel Sadelain. Thesis: "Theapeutic Hemoglobin Synthesis in Beta-Thalassemic Mice Expressing Lentivirus-Encoded Human Beta-Globin."

McAvoy, Thomas Andrew, B.S., 1993, Virginia Polytechnic Institute. Pharmacology, Professor Hugh Hemmings, Jr. Thesis: "Identification and Characterization of Protein Phosphatase 1 Binding Proteins in Rat Brain."

Messaoudi, Ilhem, B.Sc., 1996, Lafayette College. Immunology, Professor Janko Nikoli?-Zugi?. Thesis: "The Relationship between Major Histocompatibility Encoded Class I Polymorphism, T Cell Repertoire Diversity and Immune Defense."

Millard, Stanley Sean, B.A., 1993, Columbia University. Molecular Biology, Professor Andrew Koff. Thesis: "A Molecular Analysis of p27 Translational Regulation."

Mossessova, Elena S., B.S., 1994, Russian State Medical University (Russia); M.S., 1996, New York University. Molecular Biology, Professor Christopher D. Lima. Thesis: "Molecular Analysis of ULP1 Protease and its Substrate, the Ubiquitin-Like Modifier SUMO."

Park, Michele Saehwa, A.B., 1994, Princeton University. Molecular Biology, Professor Andrew Koff. Thesis: "A Genetic Analysis of the Relationship between the Rb Tumor Suppressor Protein and the Cyclin-Dependent Kinase Inhibitor p27."

Peng, Yufeng, B.S., 1993, University of Science and Technology of China (People's Republic of China). Immunology, Professor Keith Elkon. Thesis: "Modulation of Immune Responses Against Replication Defective Adenoviral Vectors."

Rothschild, Gerson, B.A., 1990, Columbia University. Neuroscience, Professor Peter Besmer. Thesis: "The Role of the Proto-Oncogene C-Kit in Gametogenesis: Potential Binding Partners and Effects on Downstream Signal Transduction."

Rajasekaran, Sigrid Anne-barbara, M.S., 1995, University of Ulm (Germany). Physiology, Biophysics and Molecular Medicine, Professor Lawrence G. Palmer. Thesis: "Role of Na, K-ATPase In Epithelial Polarity."

Schaffer, András, M.D., 1993, University Medical School of Pecs (Hungary). Immunology, Professor Paolo Casali. Thesis: "Transcriptional Regulation of the Human Ig Heavy Chain Gene Locus: Class Switch DNA Recombination and Somatic Hypermutation."

Schlondorff, Johannes Sebastian*, B.S., 1994, Harvard University. Cell Biology and Genetics, Professor Carl Blobel. Thesis: "Regulation of Ectodomain Shedding: Insights from Studying Tumor Necrosis ? Convertase (TACE) and TRANCE Shedding."

Srethapakdi, Mary, B.A., 1993, Cornell University. Molecular Biology, Professor Neal Rosen. Thesis: "Induction of RB-Dependent Cell Cycle Arrests by the Ansamycins."

St. John, Gregory, B.A., 1993, State University of New York. Immunology, Professor Carl Nathan. Thesis: "Microbial Genes

that Confer Resistance to Reactive Nitrogen Intermediates: A Study of Alkyl Hydroperoxide Reductase Subunit C from Helicobacter Pylori, and Nitric Oxide Resistance-3 and Peptide Methionine Sulfoxide Reductase from Mycobacterium Tuberculosis."

Tai, Andrew Wen-Yuan*, A.B., 1994, Harvard University. Cell Biology & Genetics, Professor Ching-Hwa Sung. Thesis: "Direct Interaction between a Light Chain of the Microtubule Motor Cytoplasmic Dynein and Rhodopsin: Insights into Dynein Function and Vectorial Transport Mechanisms."

Trevejo, José Miguel*, B.S., 1994, University of California at Los Angeles. Molecular Biology, Professor Erik Falck-Pedersen. Thesis: "The Role of TNF∝ in Dendritic Cell Maturation and Activation of the Adaptive Immune Response to Adenovirus Vectors."

Tritel, Marc, A.B., 1991, Harvard College. Cell Biology and Genetics, Professor Marilyn D. Resh. Thesis: "Biochemical Analysis Reveals Sequential Intermediates in HIV-1 Assembly."

Tumang, Joseph Ronald, B.S., 1994, State University of New York. Immunology, Professor Hsiou-Chi Liou. Thesis: "The Role of C-Rel in B Lymphocyte Growth and Survival."

Wright, Anne Myrthue, B.S., 1993, Georgetown University. Pharmacology, Professor Kathleen W. Scotto. Thesis: "Characterization and Partial Purification of the MED-1 Binding Complexes."

* Cornell/Rockefeller/Sloan-Kettering
Tri-Institutional MD-PhD Student

MASTERS OF SCIENCE

Dahlen, Kari, B.S., 1996, Brown University. Neuroscience, Professor Joy Hirsch. Thesis: "Examination of Anxiety and Treatments Using fMRI."

Figaro, Kathleen, M.D., 1996, Yale University; B.A., 1992, Princeton University. Clinical Epidemiology, Professor Pamela Williams-Russo. Master's Paper Project: "Perceptions of Risks and Benefits of Total Knee Replacement of African Americans with Osteoarthritis."

Foster, Jordan, M.D., 1994, State University of New York; B.A., 1989, Columbia University. Clinical Epidemiology, Professor Mary Charlson. Master's Paper Project: "Diagnosing Heart Disease in Latino Patients in the Emergency Department: The Impact of Language."

Ogedegbe, Gbenga, M.D., 1988, Dunetsk State Medical Institute (Ukraine). Clinical Epidemiology, Professor Carol Mancuso. Master's Paper Project: "Medication Adherence in Hypertensive African-Americans."

Wold, Eric, M.D., 1996, University of Pennyslvania; B.A., 1990, Brown University. Clinical Epidemiology, Professor Mary Charlson. Master's Paper Project: "Evaluation of Computerized Presentation of Numerical Risk/Benefit Information to Patients Deciding on Elective Treatment for Peripheral Arterial Disease."

DEGREE RECIPIENTS 1999-2000

DOCTORS OF PHILOSOPHY

Bence-Hanulec, Kendra Kathleen, B.A., 1993, Colgate University. Physiology, Biophysics and Molecular Medicine, Professor John Marshall. Thesis: "Insulin-like Growth Factor-1 Modulation of Neuronal L-type Calcium Channels."

Birk, Alexander Victor, B.S., 1994, City University of New York, York College. Pharmacology, Professor Hazel Szeto. Thesis: "Role of Adenine Nucleotides and their Metabolism in Regulation of Platelet Reactivity."

Cheng, Chonghui, M.S., 1993, Notre Dame University; B.M., 1990, Beijing Medical University. Biochemistry and Structural Biology, Professor Stewart Shuman. Thesis: "Structural and Functional Analysis of Vaccinia Virus DNA Topoisomerase."

Dimova, Dessislava Kostadinova, M.Sc. 1991, Sofia University. Molecular Biology, Professor Mary Ann Osley. Thesis: "Antagonizing Transcriptional Repression of a Cell Cycle Regulated Yeast Promoter."

Eubanks, Sharon Kay, B.S., 1980, University of Redlands. Biochemistry and Structural Biology, Professor Esther Breslow. Thesis: " Folding Properties, Stability and Functions Among Oxtytocin-Associated Neurophysins and the Oxytocin Precursor."

Glickstein, Sara, B.S., 1992, University of Pittsburgh. Neuroscience, Professor Donald Reis, Thesis: "Substrate and Mechanism of Central Neutogenic Neuroprotection."

Jacovina, Andrew Thomas, B.S. 1990, State University of New York, Stony Brook. Biochemistry and Structural Biology, Professor Katherine Hajjar. Thesis: "The Regulation of Annexin II Gene Expression and Function during Nerve Growth Factor-Induced Differentiation of PC-12 Cells.

Katz, Luba, B.S., 1992, McGill University. Cell Biology and Genetics, Professor Patrick Brennwald. Thesis: "Molecular Genetic Analysis of the Post-Golgi SNARE Protein Complex in S. Cerevisiae."

Leifer, Cynthia Anne, B.S., 1993, University of Maryland. Immunology, Professor Carl Nathan. Thesis: "Heat Shock Protein 90 Mediates Macrophage Activation by Taxol and Bacteria Lipopolysaccharide."

Liu-Chen, Xinyue, B.M.Sc., 1992, Beijing Medical University, Neuroscience, Professor Joseph Bertino. Thesis: "Novel Strategies to Treat Human Cancers Resistant to Thymidylate Synthase Inhibitors."

Maer, Andreia Mirela, M.S., 1993, University of Bucharest; B.S., 1992, University of Bucharest. Physiology, Biophysics and Molecular Medicine, Professor Olaf Andersen. Thesis: "Gramicidin Channels as Probes for the Interactions between Membrane Proteins and Lipid Bilayers."

Markus, Maurice*, B.S., 1993, Penn State University. Cell Biology and Genetics, Professor Robert Benezra. Thesis: "E-Protein Homodimers: Regulation by Redox and Repression."

Mei, Jianfeng, M.Sc., 1988, Amoy University; B.Sc., 1985, Amoy University, Neuroscience, Professor Gavril W. Pasternak. Thesis: "Pharmacological Characterization of Mouse and Rat Signal Receptor."

Mennitt, Patricia Anne, B.S.N., 1993, University of Virginia, B.S., 1987, Alfred University. Physiology, Biophysics, and Molecular Medicine, Professor Randi Silver, Thesis: "ROMK Expression in the Kidney."

Nachman-Clewner, Michelle, B.Sc., 1990, Hebrew University. Neuroscience, Professor Ellen Townes-Anderson. Thesis: "The Photoreceptor Ribbon Synapse: Plasticity of the Axon and the Role of Calcium."

Neel, Olivia Davis, B.S., 1990, St. John's College. Biochemistry and Structural Biology, Professor Hugh Robertson. Thesis: "The RNA Processing of the Hepatitis Delta Virus."

Noramly, Selina, B.A., 1992, Oxford University. Molecular Biology, Professor Paul Goetnick. Thesis: "Coordinate Actions of BMP, WNT, SHH, Notch an FGF Signaling Pathways Mediate Patterning of the Feather Tract."

Pinto, Shirley, B.A., 1988, New York University. Neuroscience, Professor Tim Tully, Thesis: "The Latheo Mutation Disrupts Neuronal Proliferation and Olfactory Learning in Drosophila Melanogaster."

Qin, Jie, B.S., 1994, Beijing University. Immunology, Professor Alan Houghton. Thesis: "Immune Recognition of the Mouse Brown Locus Protein gp75/Tyrosine-Related-Protein-1 (TRP-1) and Variants."

Rollins, Robert A., B.A., 1992, Colgate University. Molecular Biology, Professor Dale Dorsett. Thesis: "The Genes of Drosophila Nipped Locus Participate in Activation by Remote Enhancers and Notch Receptor Signaling."

Shiloh, Michael Uri*, B.A., 1993, Pennsylvania State University. Immunology, Professor Carl Nathan. Thesis: "A Battle for Survival: Macrophage Antimicrobial Mechanisms and Bacterial Resistance to Those Mechanisms."

Sibille, Etienne L., B.S., 1994, Ramapo College. Pharmacology, Professor Miklos Toth. Thesis: "Genetic Manipulations of Serotonin 1A and 2A Receptors: Implications for Depression and Anxiety."

Sinclair, Meeghan Longmoor, B.A., 1992, City University of New York, Hunter College, Neuroscience, Professor Lonny Levin. Thesis: "Cytosolic Adenylyl Cyclase Defines a Unique Signaling Molecule in Mammals."

Soos, Timothy, B.A., 1994, Middlebury College. Molecular Biology, Professor Andrew Koff. Thesis: "The Role of p27 an Cyclin E in the Regulation of G1 to S Phase Progression."

Suldan, Zalman Lewis*, B.A., 1989, University of Pennsylvania. Molecular Biology, Professor Leonard Freedman. Thesis: "Architecture of a Subcomponent of DR1P, A Multi-Protein Complex Necessary for Transcriptional Activation."

Thayer, Sarah, B.A., 1994, Earlham College, Neuroscience, Professor Kathleen W. Scotto. Thesis: "Transcriptional Activation of the MDRI Gene in Retinoic Acid-Stimulated Neuroblastoma Cells Involves Depression and Activation By Multiple SP FAmily Members."

Vakiani, Efsevia, A.B., 1993, Harvard College/Radcliffe College. Pharmacology, Professor Jochen Buck. Thesis: "Sulfotransferases: A Novel Class of Retinol Metabolizing Enzymes."

Varma, Anjali*, B.S., 1994, Pennsylvania State University, Physiology, Biophysics and Molecular Medicine, Professor Marvin Gershengorn, Thesis: "Characterization of Kaposi's Sarcdoma Associated Herpesvirus G-Protein Coupled Receptor (KSHV-GPCR) Biology."

Ward, Jeremy, A.B., 1994, Cornell University. Cell Biology and Genetics, Professor Leonard Freedman. Thesis: " The Role of the Vitamin D3 Receptor During the Course of Normal Monocyte Differentiation and During Acute Promyleocytic Leukemia."

Yao, Nina Ye-Hwa, B.Sc., 1991, University of Toronto. Molecular Biology, Professor Michael O'Donnell. Thesis: "A Structural and Functional Comparison of E. Coli, Human and T4 Phage Replicases: Defining the Mechanisms Behind Clamploading, Sliding and Unloading."

Young, Alison Zuyung*, B.A., 1992, Rutgers University. Cell Biology and Genetics, Professor Robert Benezra. Thesis: "Id1 and Id3 Double Knockout Mice Exhibit Premature Neurogenesis and Angiogenic Defects."

Zhang, Congxiao, M.S., 1990, Peking University; B.S. 1987, Peking University. Neuroscience, Professor Robert Duvoisin. Thesis: "Molecular Studies of Glutamate Receptors in Mouse Retina."

* Cornell/Rockefeller/Sloan-Kettering
Tri-Institutional MD-PhD Student

MASTERS OF SCIENCE

Arndt, Michelle, B.S., 1995, University of Minnesota. Pharmacology, Professor Hazel Szeto Thesis: "OFQ Increases Blood Pressure and Heart Rate via Sympathetic Activation in Sheep."

Liu, Franklin, A.B., 1993, Colgate University. Molecular Biology, Professor Neal Rosen. Thesis: "Herbimycin A causes RB Dependent G Block."

Krishna, Srikant, B.A., 1995, John Hopkins University. Biochemistry and Structural Biology, Professor Dimitar Nikolov. Thesis: "The Molecular Basis of Circadian Rhythms: A Regulatory Approach."

Sherman, Eric, M.D., 1993. Columbia University; B.A., 1989, University of Pennsylvania. Clinical Epidemiology, Professor Mary Charlson. Master's Paper Project: "Talk Score: An Instrument to Predict Successful Larynx Preservation in Patients with Advanced Head and Neck Neoplasms."

Graduate School Faculty Roster

Biomedical Sciences

Aicher, Sue A.
Andersen, Olaf S.
Anderson, Kathryn
Bachvarova, Rosemary F.
Baker, Harriet
Barany, Francis
Basson, Craig T.
Baylies, Mary
Beal, M. Flint
Benezra, Robert
Bergsagel, Leif
Bertino, Joseph R.
Besmer, Peter
Blanck, Thomas J.J.
Blasberg, Ronald G.
Blass, John
Blobel, Carl P.
Breslow, Esther M.
Brown, Anthony M.C.
Browne, Susan Elizabeth
Buck, Jochen
Casali, Paolo
Catanzaro, Daniel F.
Caudy, Michael A.
Cesarman, Ethel
Chaganti, Raju S.K.
Chan, Walter W.Y.
Chen-Kiang, Selina
Chuang, Ellen
Cooper, Arthur J.L.
Crow, Mary K.
Crystal, Ronald G.
Danishefsky, Samuel
Denzin, Lisa R.
Dupont, Bo
Duvoisin, Robert
Edelberg, Jay M.
Eliezer, David
Ellis, Nathan
Falck-Pedersen, Erik
Felsen, Diane F.
Fischman, Donald A.
Fisher, Robert P.
Freedman, Leonard P.
Gardner, Daniel
German, James L. III
Giancotti, Filippo G.
Gibbs, James
Gibson, Gary E.
Golanov, Euguene V.
Goldberg, Jonathan
Golde, David W.
Goldman, Steven A.
Grafstein, Bernice
Gross, Steven S.
Gudas, Lorraine J.
Gumbiner, Barry M.
Hajjar, David P.
Hajjar, Katherine A.
Hämmerling, Ulrich
Harrison, Neil L.
Hemmings, Hugh C. Jr.
Hempstead, Barbara L.
Herzlinger, Doris
Hirsch, Joy
Holland, Eric C.
Holloman, William K.
Houghton, Alan N.
Huang, Xin-Yun
Hurwitz, Jerard
Inturrisi, Charles E.
Ivashkiv, Lionel B.
Jasin, Maria
Joh, Tong H.
Keeney, Scott
King, Philip D.
Koff, Andrew
Kolesnick, Richard N.
Koutcher, Jason A.
Lacy, Elizabeth
Levi, Roberto
Levin, Lonny R.
Li, Gloria C.
Lima, Christopher D.
Liou, Hsiou-Chi
Lloyd, Kenneth O.
Lu, Min
Lue, Neal F.
Ma, Xiaojing
Maack, Thomas
MacLaren, Noel
Marians, Kenneth J.
Marks, Paul A.
Massagué, Joan
Maxfield, Frederick R.
McGraw, Timothy
Meluh, Pamela
Miesenböck, Gero
Mikawa, Takashi
Milner, Teresa A.
Moore, John P.
Moore, Malcolm A.S.
Muller, William A.
Murray, Diana
Murray, Henry W.
Nathan, Carl F.
Nikolov, Dimitar B.
Niswander, Lee
Okamoto, Michiko
O'Reilly, Richard J.
Palmer, Lawrence G.
Pamer, Eric
Pandolfi, Pier Paolo
Pardee, Joel D.
Pasternak, Gavril W.
Patel, Dinshaw J.
Pavletich, Nikola P.
Petrie, Howard T.
Pickel, Virginia M.
Plum, Fred
Posner, Jerome B.
Posner, Michael I.
Posnett, David N.
Ptashne, Mark
Purpura, Keith
Quadri, Luis E. N.
Reidenberg, Marcus M.
Resh, Marilyn D.
Rifkind, Arleen B.
Rifkind, Richard A.
Robertson, Hugh D.
Rodriguez-Boulan, Enriqué
Rosen, Neal
Rothman, James E.
Roux, Benoît
Rutishauser, Urs
Ryan, Timothy A.
Sadelain, Michel
Salmon, Jane E.
Sant'Angelo, Derek
Schattner, Elaine
Scheinberg, David A.
Schwer, Beate
Shuman, Stewart
Silver, Randi B.
Silverstein, Roy L.
Sirotnak, Francis M.
Smith, Kendall A.
Söllner, Thomas H.
Son, Jin H.
Staiano-Coico, Lisa
Studer, Lorenz
Sung, Ching-Hwa
Szeto, Hazel H.
Tate, Suresh S.
Tempst, Paul
Toth, Miklos
Trifiletti, Rosario R.
van den Brink, Marcel
Varmus, Harold E.
Victor, Jonathan D.
Volpe, Bruce T.
Wagner, John A.
Wang, Yi
Weinstein, Alan M.
Weksler, Marc E.
Wiedmann, Martin
Wilson, Paul A.
Wu, Hao
Xu, Chanxing Wilson
Zhang, J. Jillian
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Clinical Epidemiology & Health Service Research

Adelman, Ronald D.
Alexopoulos, George S.
Allegrante, John P.
Blutt, Mitchell J.
Botvin, Gilbert J.
Braude Robert M.
Brown, Lawrence D.
Bruce, Martha L.
Callahan, Mark A.
Charlson, Mary E.
Fein, Oliver T.
Fins, Joseph J.
Hollenberg, James P.
Kenkel, Donald S.
Kuder, John M.
Lachs, Mark S.
Mancuso, Carol A.
McCulloch, Charles E.
Meyers, Barnett S.
Paget, Stephen A.
Peterson, Margaret G. E.
Pillemer, Karl
Robbins, Laura
Ruchlin, Hirsch S.
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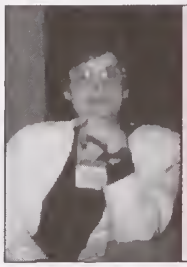

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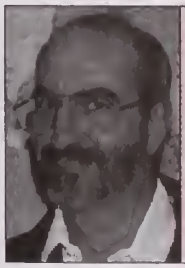

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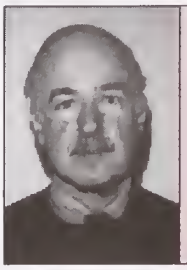

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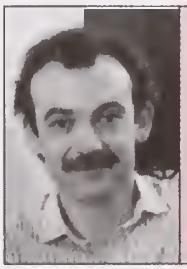

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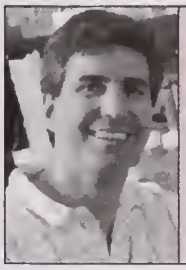

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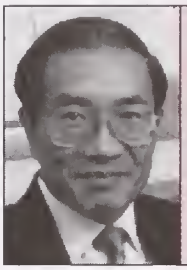

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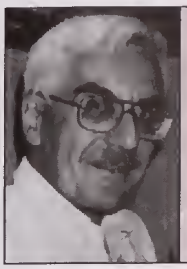

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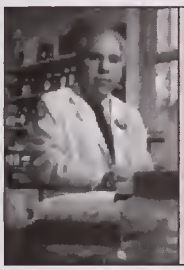

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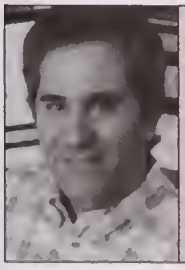

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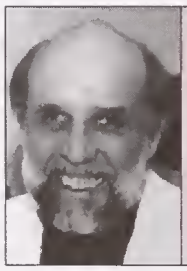

James Gibbs, M.D.

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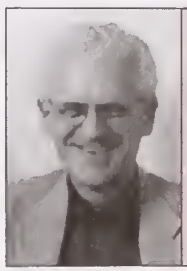

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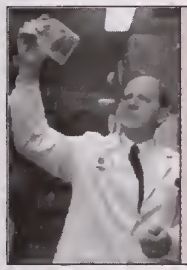

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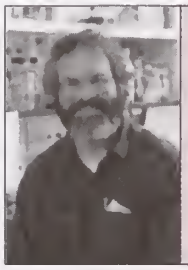

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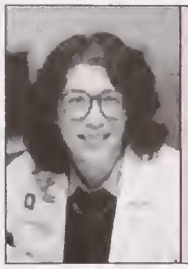

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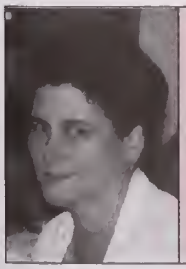

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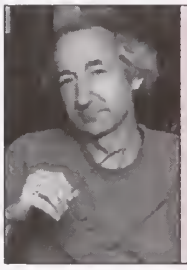

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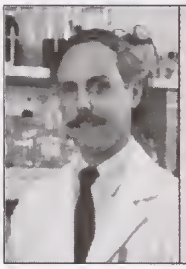

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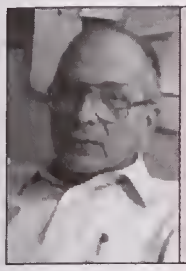

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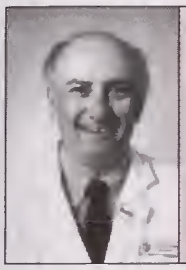

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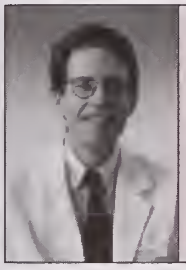

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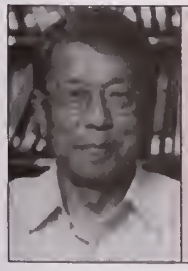

Tong H. Joh, Ph.D.

Neuroscience

Professor of Neuroscience. B.S. 1953, Seoul National University; Ph.D. 1971, New York University.

Scott Keeney, Ph.D.

Molecular Biology | Biochemistry & Structural Biology

Assistant Professor of Molecular Biology. B.S. 1987, Virginia Polytechnic Institute; Ph.D. 1993, University of California, Berkeley.

Philip D. King, Ph.D.

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Professor of Pharmacology. M.D. 1960, University of Florence.

Lonny R. Levin, Ph.D.

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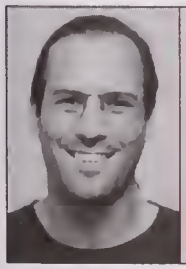
Associate Professor of Pharmacology. B.S. 1983, Cornell University; Ph.D. 1989, State University of New York, Stony Brook.

Gloria C. Li, Ph.D.

Physiology, Biophysics & Molecular Medicine

Professor of Physiology, Biophysics & Molecular Medicine. B.S. 1963, National Taiwan University; M.S. 1966, University of Houston; Ph.D. 1971, Stanford University.



Christopher D. Lima, Ph.D.

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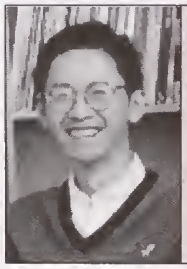

Neal F. Lue, M.D., Ph.D.

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Xiaojing Ma, Ph.D.

Immunology

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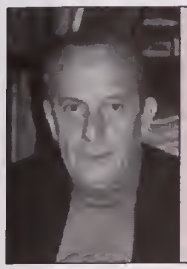

Thomas M. Maack, M.D.

Physiology, Biophysics & Molecular Medicine

Professor of Physiology, Biophysics & Molecular Medicine. M.D. 1962, University of São Paulo.

Noel Maclaren, M.D.

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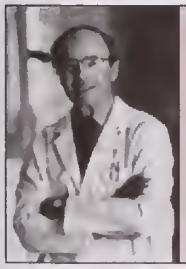
Professor of Molecular Biology. Program Chair, Molecular Biology. B.S. 1972, Polytechnic Institute of Brooklyn; Ph.D. 1976, Cornell University.



Paul A. Marks, M.D.

Cell Biology & Genetics

Professor of Cell Biology & Genetics. A.B. 1945, M.D. 1949, Columbia University.

Joan Massagué, Ph.D.

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Frederick R. Maxfield, Ph.D.

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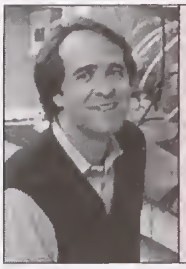

Timothy E. McGraw, Ph.D.

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Malcolm A.S. Moore, D.Phil.

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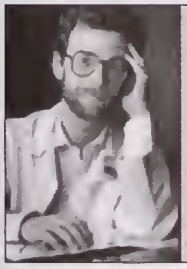

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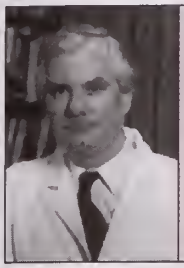
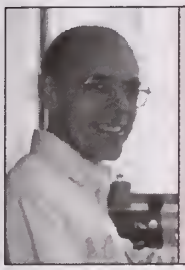
Professor of Pharmacology. B.S. 1954, Tokyo College of Pharmacy; M.S. 1957, Purdue University; Ph.D. 1964, Cornell University.



Richard J. O'Reilly, M.D.

Immunology

Professor of Immunology. A.B. 1964, College of the Holy Cross; M.D. 1968, University of Rochester.



Lawrence G. Palmer, Ph.D.

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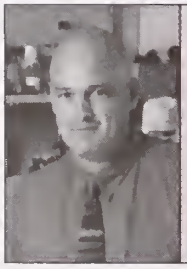

Howard T. Petrie, Ph.D.

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Associate Professor of Immunology. B.S. 1978, M.S. 1981, Pennsylvania State University; Ph.D. 1988, University of Nebraska.

Virginia M. Pickel, Ph.D.

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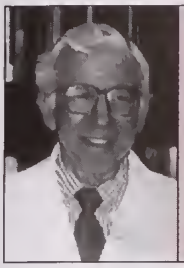
Professor of Neuroscience. B.S. 1965, M.S. 1967, University of Tennessee; Ph.D. 1970, Vanderbilt University.



Fred Plum, M.D.

Neuroscience

Professor of Neuroscience. B.A. 1944, Dartmouth College; M.D. 1947, Cornell University.

Jerome B. Posner, M.D.

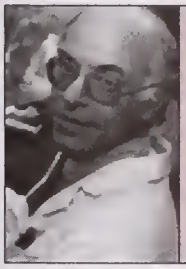
Neuroscience

Professor of Neuroscience. B.S. 1951, M.D. 1955, University of Washington.

Michael I. Posner, Ph.D.

Neuroscience

Professor of Neuroscience. B.S. 1957, M.S. 1959, University of Washington; Ph.D. 1962, University of Michigan.



David N. Posnett, M.D.

Immunology

Professor of Immunology. M.D. 1975, University of Geneva.

Mark Ptashne, Ph.D.

Molecular Biology

Professor of Molecular Biology. B.A. 1961, Reed College; Ph.D. 1968, Harvard University.

Keith Purpura, Ph.D.

Neuroscience

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Luis E. N. Quadri, Ph.D.

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Assistant Professor of Molecular Biology. B.Sc. 1991, University of Buenos Aires; Ph.D. 1996, University of Alberta.

Marcus M. Reidenberg, M.D.

Pharmacology

Professor of Pharmacology. M.D. 1958, Temple University.

Marilyn D. Resh, Ph.D.

Cell Biology & Genetics | Biochemistry & Structural Biology

Professor of Cell Biology & Genetics. B.A. 1977, Princeton University; Ph.D. 1982, Harvard University.

Arleen B. Rifkind, M.D.

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Professor of Pharmacology. B.A. 1960, Bryn Mawr College; M.D. 1964, New York University.

Richard A. Rifkind, M.D.

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Professor of Cell Biology & Genetics. B.S. 1951, Yale University; M.D. 1955, Columbia University.

Hugh D. Robertson, Ph.D.

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Neal Rosen, M.D., Ph.D.

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James E. Rothman, Ph.D.

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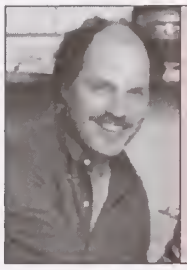
Benoît Roux, Ph.D.

Biochemistry & Structural Biology | Physiology, Biophysics & Molecular Medicine

Professor of Biochemistry & Structural Biology. B.Sc., 1981; M.Sc. 1984, University of Montreal; Ph.D., 1990, Harvard University.



Urs Rutishauser, Ph.D.

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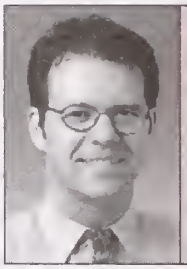
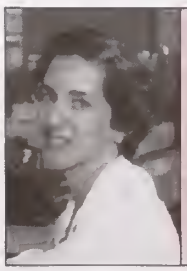


Michel Sadelain, M.D., Ph.D.

Immunology

Associate Professor of Immunology. M.Sc., M.D. 1984, University of Paris; Ph.D. 1989, University of Alberta.



Jane E. Salmon, M.D.

Immunology

Associate Professor of Immunology. A.B. 1972, New York University; M.D. 1978, Columbia University.

Derek B. Sant'Angelo, Ph.D.

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Elaine Schattner, M.D.

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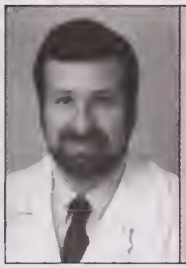
Assistant Professor of Immunology. B.A. 1982, Yale University; M.D. 1987, New York University.



David A. Scheinberg, M.D., Ph.D.

Pharmacology

Professor of Pharmacology. A.B. 1977, Cornell University; M.D., Ph.D. 1983, Johns Hopkins University.

Beate Schwer, Ph.D.

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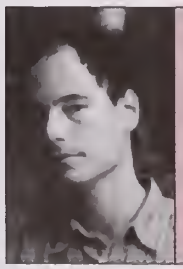
Associate Professor of Molecular Biology. Diploma. 1984, Tubingen; Ph.D. 1989, University of Heidelberg.



Stewart Shuman, M.D., Ph.D.

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Professor of Molecular Biology. B.A. 1976, Wesleyan University; M.D., Ph.D. 1983, Albert Einstein College of Medicine.

Randi B. Silver, Ph.D.

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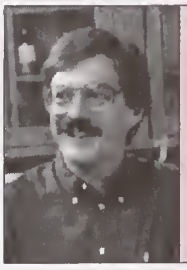
Associate Professor of Physiology, Biophysics & Molecular Medicine. B.A. 1979, Skidmore College; Ph.D. 1986, Brown University.



Roy L. Silverstein, M.D.

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Professor of Cell Biology & Genetics. B.S. 1975, Brown University; M.D. 1979, Emory University.

Francis M. Sirotnak, Ph.D.

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Kendall A. Smith, M.D.

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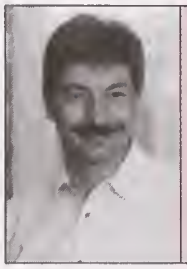
Professor of Immunology. B.S. 1964, Denison University; M.D. 1968, The Ohio State University.



Thomas H. Söllner, Ph.D.

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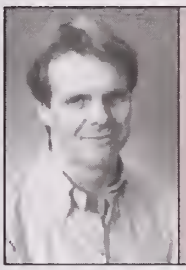

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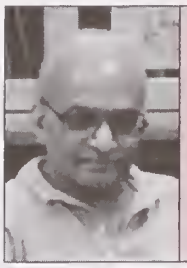
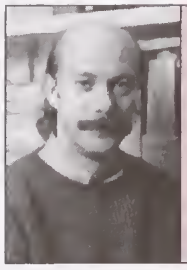


Suresh S. Tate, Ph.D.

Biochemistry & Structural Biology

Professor of Biochemistry & Structural Biology. B.Sc. 1958, M.Sc. 1960, University of Baroda; Ph.D. 1963, University of London.



Paul Tempst, Ph.D.

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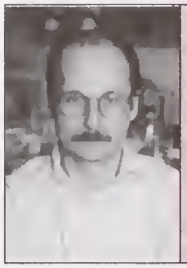

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Rosario R. Trifiletti, M.D., Ph.D.

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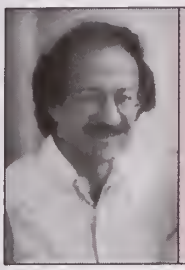

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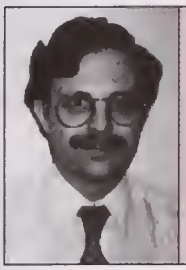
Cell Biology & Genetics

Professor of Cell Biology & Genetics. B.A., 1961 Amherst College; M.A. 1962, Harvard University; M.D. 1966, Columbia University.



Jonathan D. Victor, M.D., Ph.D.

Neuroscience

Professor of Neuroscience. B.A. 1973, Harvard University; Ph.D. 1979, The Rockefeller University; M.D. 1980, Cornell University.

Bruce T. Volpe, M.D.

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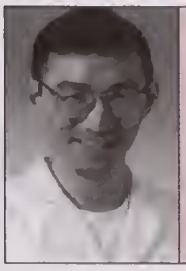
Professor of Neuroscience. B.S. 1969, M.D. 1973, Yale University.

John A. Wagner, Ph.D.

Neuroscience | Cell Biology & Genetics

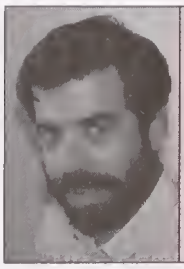
Professor of Neuroscience. B.S. 1970, Loras College; Ph.D. 1975, Princeton University.



Yi Wang, Ph.D.

Physiology, Biophysics & Molecular Medicine

Associate Professor of Physiology, Biophysics & Molecular Medicine. B.S. 1986, Fudan University; M.S. 1988, University of Wisconsin, Milwaukee; Ph.D. 1994, University of Wisconsin.



Alan M. Weinstein, M.D.

Physiology, Biophysics & Molecular Medicine

Professor of Physiology, Biophysics & Molecular Medicine. A.B. 1971, Princeton University; M.D. 1975, Harvard University.

Marc E. Weksler, M.D.

Immunology

Professor of Immunology. B.A. 1958, Swarthmore College; M.D. 1962, Columbia University.

Martin Wiedmann, Ph.D.

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Associate Professor of Cell Biology & Genetics. Diplom 1975, University of Greifswald; Ph.D. 1979, University of Potsdam.

Paul A. Wilson, Ph.D.

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Assistant Professor of Cell Biology and Genetics. B.A. 1980, Princeton University; M.Sc., London School of Economics; Ph.D. 1990, University of California, Berkeley.

Hao Wu, Ph.D.

Biochemistry & Structural Biology | Immunology

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C. Wilson Xu, Ph.D.

Pharmacology

Assistant Professor of Pharmacology. B.Sc. 1984, Nanjing University; Ph.D. 1991, Massey University.

Jue Jillian Zhang, Ph.D.

Biochemistry & Structural Biology | Immunology

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Pengbo Zhou, Ph.D.

Molecular Biology

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Clinical Epidemiology & Heath Service Research Faculty

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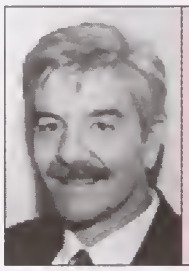
Clinical Epidemiology

Assistant Professor of Medicine. A.B. 1974, University of California, Berleley, M.D. 1978, Albert Einstein College of Medicine.



George Alexopoulos, M.D.

Clinical Epidemiology

Professor of Psychiatry. M.D. 1970, National University of Athens.

John P. Allegrante, Ph.D.

Clinical Epidemiology

Adjunct Professor of Behavioral Science. B.S. 1974, State University of New York, Cortland; M.S. 1976 Ph.D., 1979, University of Illinois.

Mitchell Blutt, M.D., M.B.A.

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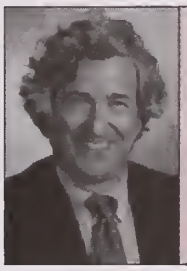
Clinical Epidemiology

Frances and John Loeb Librarian of Medicine. B.A. 1962, M.S. 1964, M.L.S. 1964, University of California, Los Angeles; Ph.D. 1987, University of Nebraska.



Lawrence D. Brown, Ph.D.

Clinical Epidemiology

Adjunct Professor of Health Policy and Management. B.A. 1969, Harvard College; Ph.D. 1973 Harvard University.

Martha L. Bruce, Ph.D., M.P.H.

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Oliver T. Fein, M.D.

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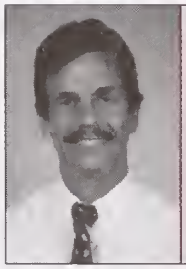
Professor of Clinical Medicine. Professor Clinical Public Health. B.A. 1962, Swarthmore College; M.D. 1967, Western Reserve University.

Joseph J. Fins, M.D.

Clinical Epidemiology

Associate Professor of Medicine, B.A. 1982, Wesleyan University; M.D. 1986, Cornell University.



James P. Hollenberg, M.D.

Clinical Epidemiology

Associate Professor of Medicine. A.B. 1976, Harvard University; M.D. 1980, Columbia University.

Donald S. Kenkel, Ph.D.

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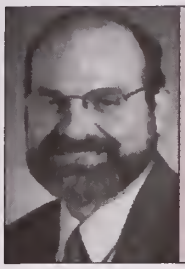
Associate Professor Policy Analysis and Management. B.A., 1981 University of Kentucky; M.A., 1983; Ph.D.,1987, University of Chicago.



John M. Kuder, Ph.D.

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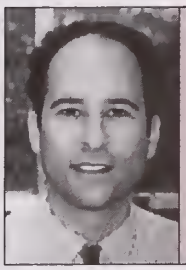
Associate Professor, Sloan Graduate Program in Health Services Administration B.A. 1971, Drake University; M.A. 1972, University of Arkansas; Ph.D. 1982, University of Michigan.



Mark S. Lachs, M.D., M.P.H.

Clinical Epidemiology

Assistant Professor of Medicine. B.A. 1981, University of Pennsylvania; M.D. 1985, New York University; M.PH. 1990, Yale University.

Carol A. Mancuso, M.D.

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Charles E. McCulloch, M.S., Ph.D.

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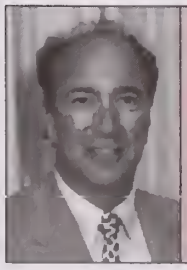

Barnett S. Meyers, M.D.

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Professor of Clinical Psychiatry. M.D., 1966, New York University.

Stephen Paget, M.D.

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Professor of Medicine. B.A. 1966, Brooklyn College; M.D. 1971, New York State University, Downstate.

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Karl Pillemer, Ph.D.

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Associate Professor of Human Development and Family Studies. B.A. 1977, Boston University; M.A. 1981, Ph.D. 1985, Brandeis University.

Laura Robbins, D.S.W.

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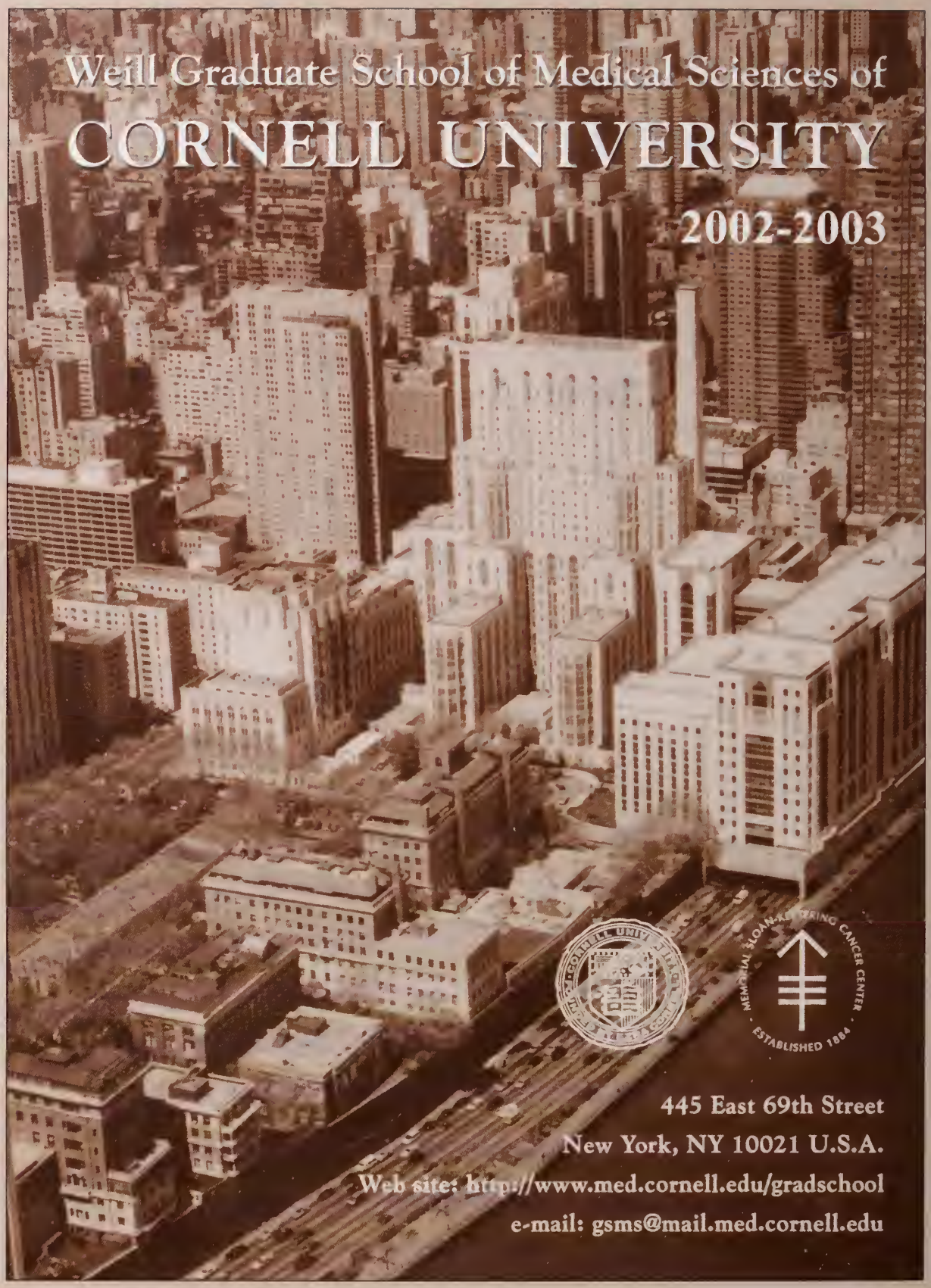

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